Installation and maintenance instructions

Heat Interface Unit

Greenstar HIU, HIU E, HIU E Plus & HIU KE Plus

For connection to a district heating system supplying heating and domestic hot water

6720808928-00.1Wo

WORCESTER
Bosch Group

6 720 808 928 (2017/01) UK & IE

Contents

1 Key to symbols and safety instructions

1.1 Key to symbols

Warnings

Warnings in this document are identified by a warning triangle printed against a grey background.
Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:
- **NOTICE** indicates a situation that could result in damage to property or equipment.
- **CAUTION** indicates a situation that could result in minor to medium injury.
- **WARNING** indicates a situation that could result in severe injury or death.
- **DANGER** indicates a situation that will result in severe injury or death.

Important information

This symbol indicates important information where there is no risk to people or property.

Additional symbols

Symbol	Meaning
1.	a numbered step in an action sequence
▸	a step in an action sequence
→	a reference to a related part in the document or to other related documents
(1)	a reference number to identify or refer to a part or item
·	a list entry
–	a list entry (second level)

Table 1 Symbols

Examples of additional symbols used

A numbered step in an action sequence

A sequence of numbered steps or actions carried out in a specific order to complete a task.

1. First action
2. Second action
3. Third action
   etc.

A step in an action sequence

A sequence of defined actions or steps carried out in order to complete a task.

▶ Action
▶ Next action
▶ etc

A reference to a related part in the document or to other related documents.

To refer the reader to a specific figure/table/section within the manual.

→ e.g. figure 1.

A reference number to identify or refer to a part or item.

In a related figure, items or parts identified by a sequential number.

List entries, first and second levels

- A single component/item
- A component/list, made up of multiple parts/items.
  - Sub component or sublist of main component/list.
  - etc.

1.2 General safety instructions

Follow these guidelines

▶ Country-specific regulations and standards must be observed when installing the appliance.
▶ The local regulations and requirements for the electrical connection of the power supply.
▶ The regulations and standards relating to the safety equipment of the heating system.
▶ Read any installation instructions (Heat interface unit, heating controls, etc.) carefully before starting the installation.
▶ Observe the safety instructions and warnings.
▶ Observe national and regional regulations, technical rules and guidelines.
▶ Record all work carried out.

Risk of electrical shock

▶ Any electrical work or maintenance must only be carried out by qualified/registered person.
▶ Before carrying out any work on electrical components, isolate them from the power supply (230 V AC) (fuse, circuit breaker) and secure against unintentional reconnection.

Appliance operation

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge, if they have been given supervision or instruction concerning the use of the appliance, in a safe way, and understand the hazards involved.

Children shall not play with the appliance.

Cleaning and user maintenance shall not be made by children without supervision.

Important handling instructions

Care should be taken when transporting, lifting and carrying the appliance.

▶ Use a means of transport suitable for handling appliances (e.g. sack truck with strap, stair climbing or step trolley).
▶ When handling appliances, secure them against a fall.
▶ Let only trained personnel undertake the handling.
▶ The correct method for handling heavy objects should be strictly observed, at all times.

General handling guidelines

▶ Only remove packaging at the time of the final installation.
▶ Never lift or carry the appliance on your own.
▶ Never lift or carry packages by the shipping straps.
▶ During handling and unpacking, wear safety gloves to prevent injuries to your hands through sharp-edged appliance components.
▶ Dispose of packaging materials appropriately.

Packaging

The following points should be observed during unpacking:

- Check the delivery immediately upon receipt for completeness and transport damage
- In the event of transport damage, the delivery should only be accepted conditionally
- Do not use damaged components for assembly
- The first fix rail can be removed from the side of the carton via a perforated flap so that it can be fitted without having to remove the rest of the appliance and cover from the packaging. This will reduce the risk of damage to the rest of the appliance whilst the system is being commissioned. The remainder of the appliance will remain in the packaging and can be stored safely until needed.
- Carefully unpack the unit
- Ensure that all packaging material is removed and the unit is free from all materials that may prevent the unit from operating correctly

Siting and installation

Correct siting, assembly and installation of the individual components are the fundamental requirements for safe and economical operation of the appliance.

- ▶ Only trained contractors are to site and install the appliance and its components.
- ▶ The appliance must only be installed in rooms and locations that meet the manufactures requirements.

Commissioning

- ▶ The appliance and the components must only be commissioned by a competent person.
- ▶ Check all connections for leakages prior to starting up the heating system.
- ▶ All fixings and fittings must be checked and tightened if required after the unit has been installed.

Risk of damage due to operator error

Operator errors can result in injury and damage to property.

- ▶ Ensure that only personnel who can operate this appliance correctly have access to it.

Inspection, maintenance and repairs

- ▶ Inspection, maintenance and repairs must only be carried out by competent persons.
- ▶ Use only original spare parts from the manufacturer. The manufacturer can assume no liability for damage caused by spare parts not supplied by the manufacturer.

Electrical work

Electrical work must only be carried out by a qualified electrician:

- ▶ Before starting electrical work;
  - Ensure that the electricity supply is safely isolated and secure to prevent inadvertent re-connection.
  - Information on safe isolation can be found in the Health and Safety Executive Guidance HSG85.
  - Using test equipment approved to GS38 confirm that the electricity supply is disconnected.
- ▶ Refer to the manufacturer's information when installing other components with Worcester equipment within the system.

Heat Exchanger

The unit contains copper-brazed stainless steel heat exchangers.

Please ensure the system complies with the requirements in **BS EN 12502 Part 1 and 2** to avoid any damage caused by corrosion.

Danger of burns and scalds

- ▶ Surfaces of individual components, connections and leaking water can be very hot and cause severe burns and scalds.
- ▶ Do not touch hot surfaces.
- ▶ Caution should be taken not to touch any leaking water or drained system water unless the temperature is known and safe.

Leakage

If leaks are observed:

- ▶ Immediately close all isolation valves.
- ▶ Ensure all leaks are repaired by a suitably qualified professional.

CAUTION: The district heating side of the appliance can be operated with high pressure and high temperature systems.

- ▶ Please apply extreme caution and wear the appropriate safety equipment (PPE) when working on suspected leaks.

NOTICE: The pressure differential across the primary circuit of the heat interface unit must not exceed 80kPa (800mbar) on units without a DPCV (differential pressure control valve) as standard.
For units with internal DPCV (differential pressure control valve) fitted, the maximum differential pressure is 400kPa (4000mbar).

- ▶ A suitable means of control should be installed to limit the differential pressure if the system design is expected to exceed the limits above (depending on the HIU model).

Instructing the customer

When handing over, instruct the user how to operate the heating system and inform them about its operating conditions.

- ▶ Explain how to operate the heating system and draw the user's attention to any safety-relevant action.
- ▶ Explain that modifications and repairs must only be carried out by an authorised contractor.
- ▶ Hand customers the appliance documentation for safekeeping.

2 Appliance information

2.1 General information

Model matrix

Model	Heat meter	Differential pressure control valve	Summer by-pass	Keyless filling link assembly	Flushing valve	Vertical pipe kit	Heat meter adaptor kit	Domestic hot water output (KW)[1]	Domestic hot water flow rate (l/m)[2]	Flow regulator colour	Central heating output (kW)
HIU KE Plus with heat meter	Yes	Yes	Yes	Yes	Accessory	Accessory	No	58.6	21	Red	15
HIU KE Plus	No	Yes	Yes	Yes	Accessory	Accessory	Accessory	58.6	21	Red	15
HIU E Plus with heat meter	Yes	Yes	Yes	Yes	Accessory	Accessory	No	39.1	14	Pink	15
HIU E Plus	No	Yes	Yes	Yes	Accessory	Accessory	Accessory	39.1	14	Pink	15
HIU E with heat meter	Yes	Yes	Accessory	Yes	Accessory	Accessory	No	39.1	14	Pink	15
HIU E	No	Yes	Accessory	Yes	Accessory	Accessory	Accessory	39.1	14	Pink	15
HIU with heat meter	Yes	Accessory	Accessory	Yes	Accessory	Accessory	No	39.1	14	Pink	15
HIU	No	Accessory	Accessory	Yes	Accessory	Accessory	Accessory	39.1	14	Pink	15

Table 2 Model matrix

1) Domestic hot water output values are for a temperature rise of 40K.

2) Domestic how water flow rate values are for a temperature rise of 40K.

Main Features

- Easy to install with minimal installation space required.
- Internally insulated to minimise heat loss.
- Provides domestic hot water and central heating to properties.
- Hydraulic system separation with two heat exchangers.
- Domestic hot water demands take priority over central heating demands.
- The domestic hot water plate heat exchanger temperature is optimised to reduce the risk of lime scale formation.
- The electronic control unit provides fully modulated central heating and domestic hot water temperature control.
- Temperature controlled primary heating flow, via a by-pass valve, ensures heat is immediately available when domestic hot water is required.
- Low return temperature in the primary circuit maximises efficiency of the system.
- The appliance can be supplied with or without a heat meter fitted.
- Installation pipe work can be routed down behind the back of the HIU.
  - Pre-plumbing kit available

2.2 Intended use

The appliance provides domestic hot water and central heating to properties that are serviced from district heating or central boiler plants. The appliance consists of two heat exchangers, one for the domestic hot water providing instant hot water at a safe regulated temperature and the second for central heating. The appliance is indirect so the primary heating circuit is hydraulically separated from the property central heating by the second plate heat exchanger. Domestic hot water takes priority over the central heating demand.

This appliance must only be used as a source of heating and hot water in a sealed system.

Refer to the details on the type plate and the specifications to ensure correct use of this appliance.

2.3 Misuse

Appliance must be used as per the intended use statement. Operation outside the parameters of the intended use is considered misuse and could cause harm to people and damage to property.

Using the appliance outside of its intended use may also invalidate the manufacturer's guarantee.

2.4 Declaration of conformity

This product, in design and operation, conforms to the European Directives and supplementary national requirements.

Compliance is demonstrated by the CE marking.

You can request the declaration of conformity for the product. To do so, send your request to the address on the back of the manual.

The appliance is tested to the relevant clauses of the following standards: EN60335,EN62233,EN55014 and EN61000.

2.5 Type plate

Refer to figure 1

The type plate contains information on device performance, the registration data and the serial number. This is located inside the appliance cover [2].

There is an addition data label [1] which also has the registration data and the serial number. This is located on the back plate behind the control unit.

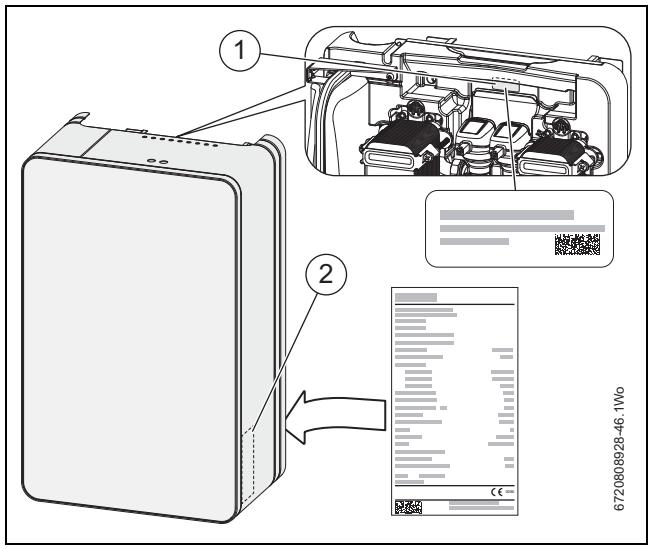


Fig. 1 Type plate location

Customer identification of the appliance

Refer to figure 2

The customer can easily identify the appliance as there is also a additional data label [1.] This contains information of the appliance model and serial number and is located on the bottom centre of the cover panel.

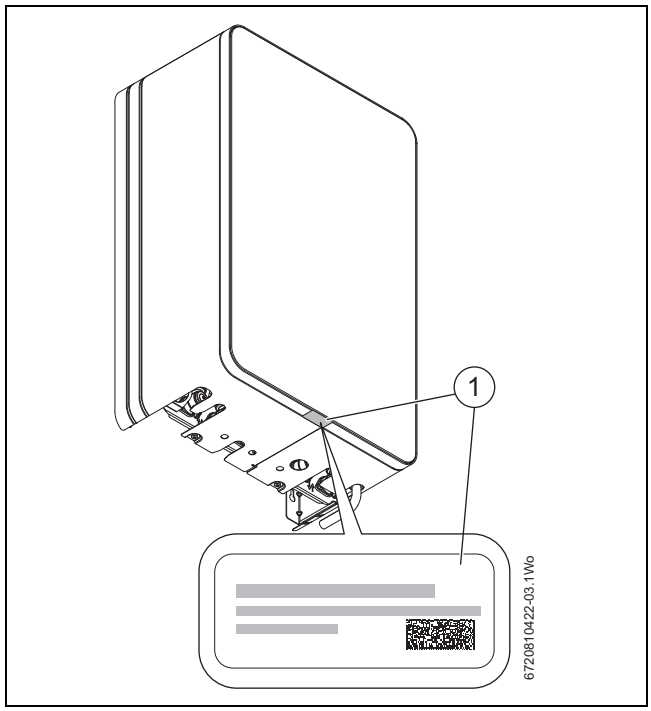


Fig. 2 Customer data label

2.6 Standard delivery

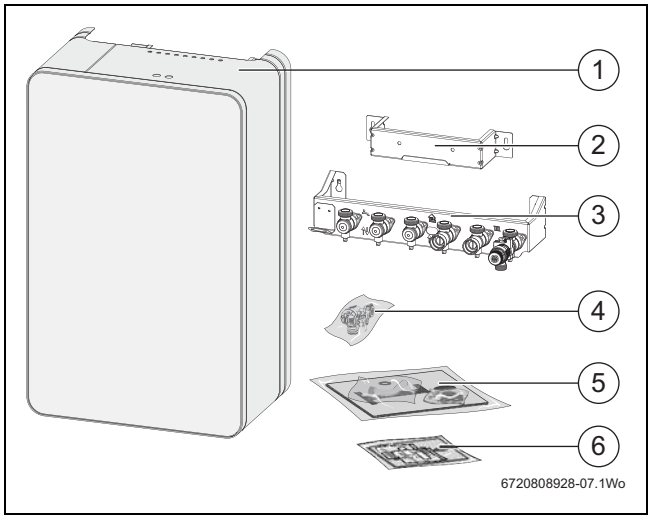


Fig. 3 Standard package contents

[1] Heat Interface Unit
[2] Support bracket
[3] Mounting frame
[4] Filling link assembly
[5] Fittings and literature pack:
- Installation and Maintenance Instructions
- User Instructions
- Wall mounting template
- Sealing pack
- Compression fittings
- Pressure Relief Valve installer connection elbow

[6] Pre-payment scheme kit

2.7 Appliance dimensions and hydraulic connections

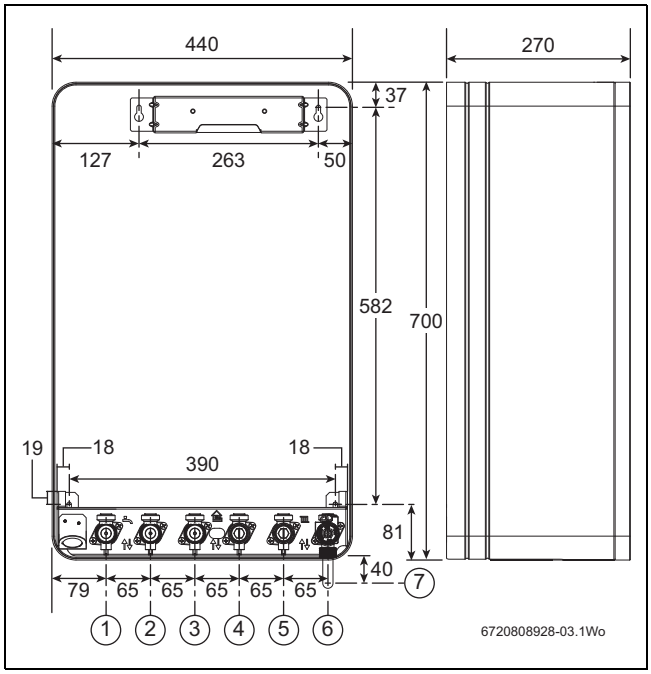


Fig. 4 Casing dimensions and hydraulic connections

[1] Cold mains inlet (22mm)
[2] Domestic Hot Water outlet (22mm)
[3] District heating supply (22mm)
[4] District heating return (22mm)
[5] Central heating flow (22mm)
[6] Central heating return (22mm)
[7] Pressure relief valve (15mm)

2.8 Internal layout

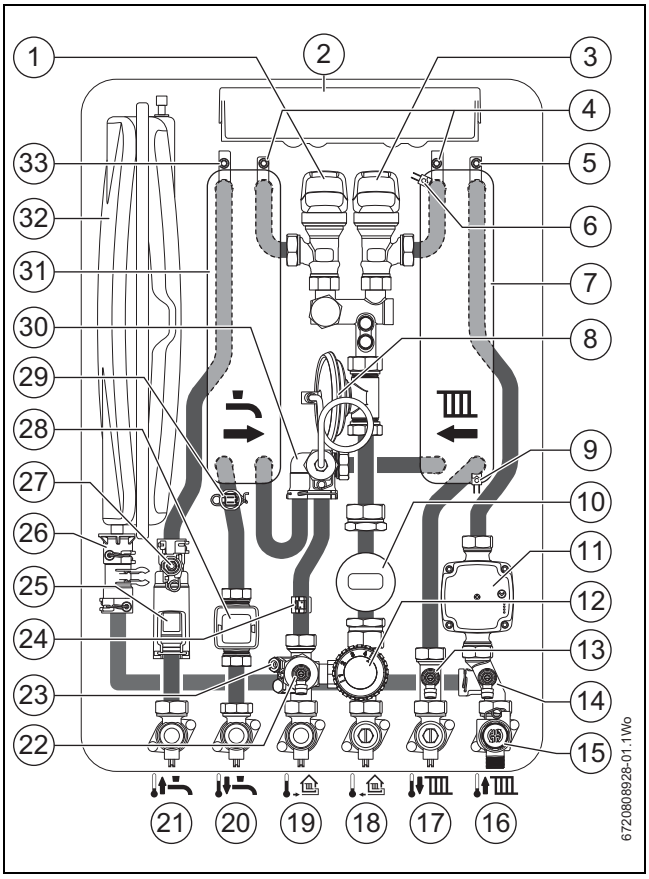


Fig. 5 Example HIU KE Plus with heat meter

[1] Domestic Hot Water control valve
[2] Control unit
[3] Central heating control valve
[4] Manual air vent (district heating)
[5] Manual air vent (central heating)
[6] Return sensor NTC (district heating)
[7] Plate heat exchanger (central heating)
[8] Differential pressure control valve (if fitted, → Table 2, Model matrix for standard component or accessory)
[9] Flow sensor NTC (central heating)
[10] Heat meter (if fitted, → Table 2, Model matrix for standard component or accessory)
[11] Central heating circulating pump
[12] By-pass valve (if fitted, → Table 2, Model matrix for standard component or accessory)
[13] Drain point (central heating flow)
[14] Drain point (central heating return)
[15] Pressure relief valve (central heating)
[16] Central heating return connection
[17] Central heating flow connection
[18] District heating return connection
[19] District heating supply connection
[20] Domestic Hot Water outlet connection
[21] Cold mains inlet connection
[22] Filter and drain point (district heating)
[23] Heat meter flow sensor connection point
[24] Supply sensor NTC (district heating)
[25] Flow turbine and flow regulator
[26] Expansion vessel connection point
[27] Domestic Hot Water pressure relief valve
[28] Domestic Hot Water safety valve
[29] Domestic Hot Water outlet sensor NTC
[30] Manifold (district heating)
[31] Plate heat exchanger (Domestic Hot Water)
[32] Expansion vessel
[33] Manual air vent (Domestic Hot Water)

2.9 Electrical schematic

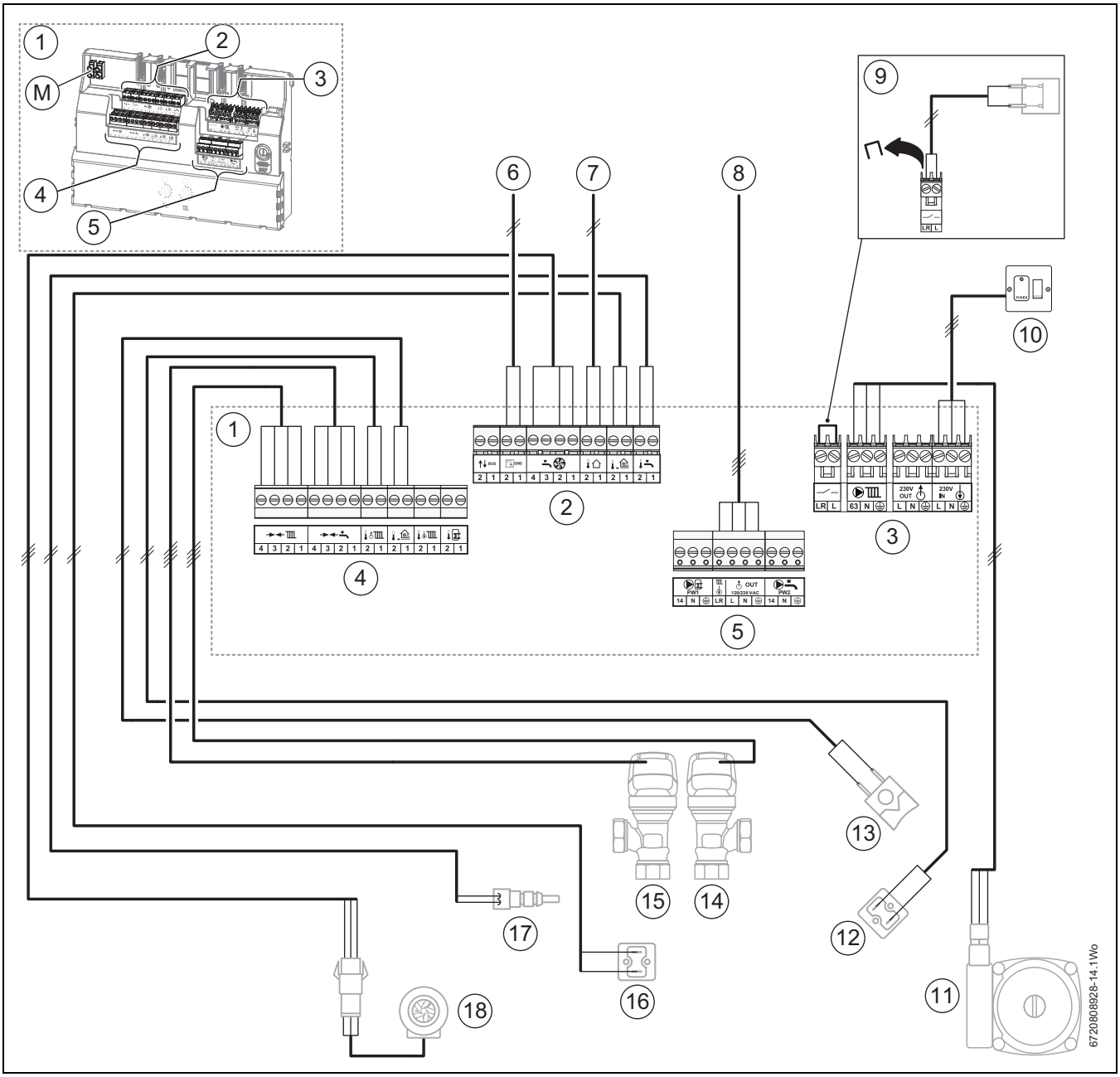


Fig. 6 Electrical schematic

[1] Control unit
[2] Low voltage connections (rear in service position)
[3] 230V connections (rear in service position)
[4] Low voltage connections (front in service position)
[5] 230V connections (front in service position)
[6] EMS BUS room controller connection
[7] Outdoor weather sensor
[8] 230V external control system
[9] Limiter connection (pre-wired link) remove link to connect limit thermostat (for under-floor heating circuit protection)
[10] Mains 230V supply
[11] Circulating pump
[12] Flow sensor NTC (central heating)
[13] Return sensor NTC (district heating)
[14] Central heating control valve
[15] Domestic Hot Water control valve
[16] Supply sensor NTC (district heating)
[17] Domestic Hot Water outlet sensor NTC
[18] Flow turbine
[M] Provision for heat meter M-Bus connection

Control unit connections

Component connections

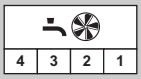
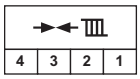
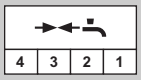
Connections/ Symbol	Function
	Circulation pump • Live output [Brown] • Neutral output [Blue] • Earth output [Green/Yellow]
	Flow turbine connection • Red • - • Yellow • Black
	Flow sensor NTC (district heating) • White • White
	Domestic Hot Water sensor NTC • Blue • Blue
	Central heating control valve • Brown • Black • White • Yellow
	Domestic Hot Water control valve • Blue • Green • Grey • Red
	Flow sensor NTC (central heating) • Yellow • Yellow
	Return sensor NTC (district heating) • Green • Green
	Not used
	Control panel fuse

Table 3

Installer connections

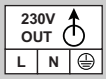
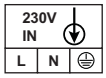
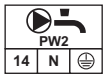
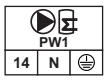
Connections/ Symbol	Function
	Limiter thermostat (under-floor safety cut-off) • Potential free
	230 V feed to external controls modules • Live output [L] • Neutral output [N] • Earth output [⏚]
	230 V supply to the appliance • Live input [L] • Neutral input [N] • Earth input [⏚]
	Not used
	Not used
	Not used
	Not used
	230 V feed to external time and temperature control • Switch live demand input [LR] • Live output [L] • Neutral output [N] • Earth output [⏚]
	Not used
	Not used

Table 4

2.10 Designation of components

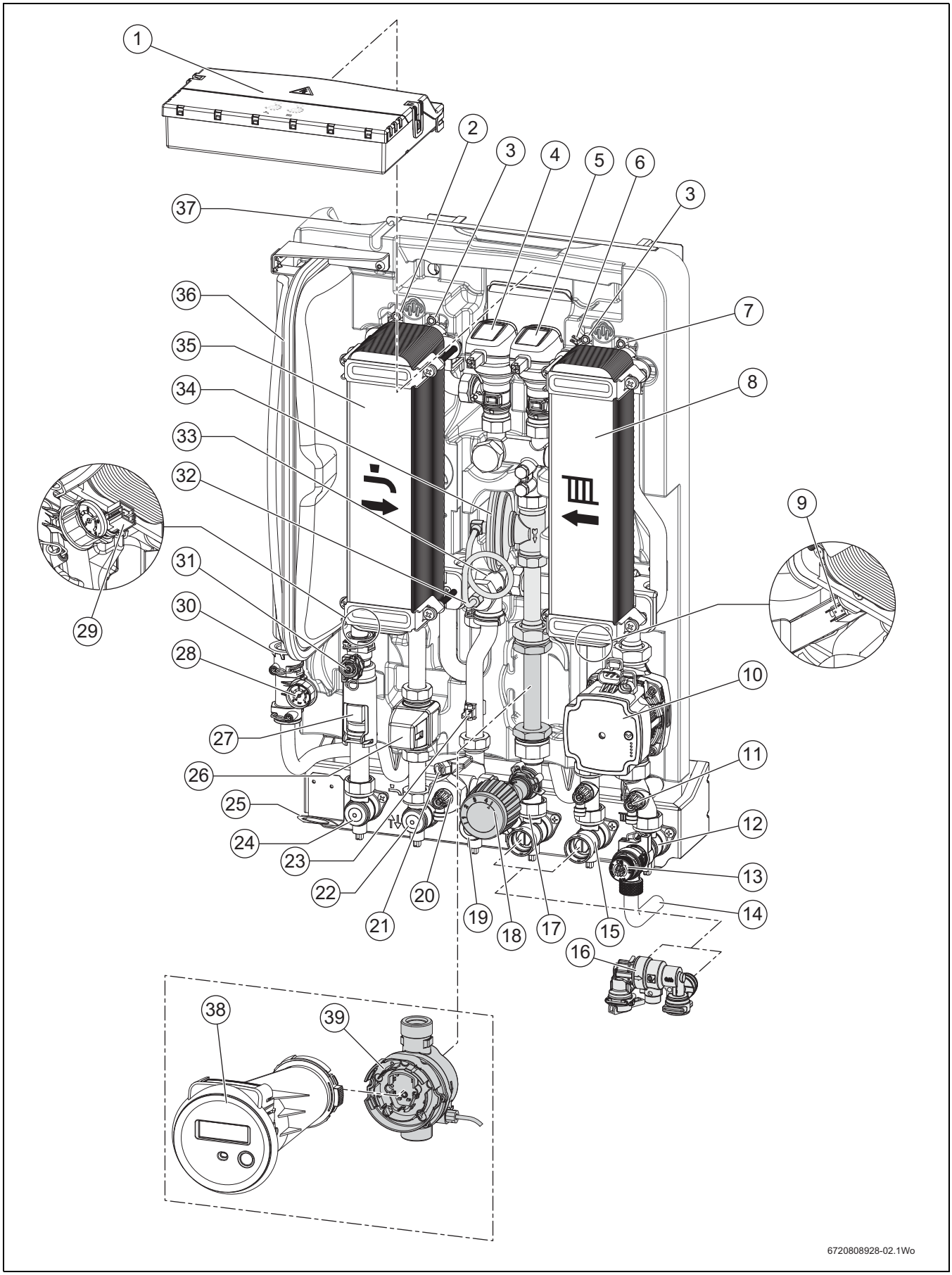


Fig. 7 Designation of components

Legend to Figure 7, Designation of components:

[1] Control unit
[2] Manual air vent (Domestic Hot Water)
[3] Manual air vent (district heating)
[4] Domestic Hot Water control valve
[5] Central heating control valve
[6] Return sensor NTC (district heating)
[7] Manual air vent (central heating)
[8] Plate heat exchanger (central heating)
[9] Flow sensor NTC (central heating)
[10] Circulating pump
[11] Drain point (central heating return)
[12] Central heating return connection
[13] Pressure relief valve (central heating)
[14] Pressure relief valve installer connection elbow
[15] Central heating flow connection
[16] Keyless filling link assembly
[17] District heating return connection
[18] Summer by-pass valve (→ Table 2, Model matrix for standard component or accessory)
[19] District heating supply
[20] Filter and drain point (district heating)
[21] Heat meter flow sensor point
[22] Domestic Hot Water outlet
[23] Supply sensor NTC (district heating)
[24] Cold mains inlet
[25] Optional position for pressure gauge (pressure gauge can be moved from position [28] here)
[26] Domestic Hot Water safety valve
[27] Domestic flow turbine and flow regulator
[28] Pressure gauge
[29] Domestic Hot Water outlet sensor NTC
[30] Expansion vessel connector
[31] Domestic pressure relief valve
[32] Differential pressure control valve capillary connection onto manifold
[33] Manifold (district heating)
[34] Differential pressure control valve (→ Table 2, Model matrix for standard component or accessory)
[35] Plate heat exchanger (Domestic Hot Water)
[36] Expansion vessel (Schrader valve located top, right hand side towards the back)
[37] Schrader valve access point
[38] Heat meter display (part of heat meter accessory), (→ Table 2, Model matrix for standard component or accessory)
[39] Heat meter sensor (part of heat meter accessory), (→ Table 2, Model matrix for standard component or accessory)

2.11 Appliance information

Technical data

Description	Units	HIU KE plus	HIU KE plus with heat meter	HIU E Plus	HIU E Plus with heat meter
General					
Height	mm	700	700	700	700
Width	mm	440	440	440	440
Depth	mm	270	270	270	270
Total unit weight (lift weight)	kg	33	33	31	31
Packaged unit weight	kg	36	36	34	34
Minimum inlet pressure to achieve nominal DHW flow rate	bar	2.0	2.0	1.5	1.5
Nominal output to domestic hot water[1)]	kW	58.6	58.6	39.1	39.1
Output range to central heating	kW	1.5 - 15	1.5 - 15	1.5 - 15	1.5 - 15
Maximum flow temperature secondary heating	°C	80	80	80	80
Maximum flow temperature DHW	°C	60	60	60	60
District heating flow and return connections (compression)	mm	22	22	22	22
Secondary heating flow and return connections (compression)	mm	22	22	22	22
Cold feed and DHW connections (compression)	mm	15	15	15	15
Pressure relief valve connection	mm	15	15	15	15
Maximum district limited flow rate with integrated DPCV	l/s	0.38	0.38	0.355	0.355
Maximum working pressure district heating side	bar	10	10	10	10
Pressure relief valve setting secondary heating side	bar	3	3	3	3
Maximum working pressure domestic hot water side	bar	10	10	10	10
pH value (district water supply), approximate		7-9	7-9	7-9	7-9
Expansion vessel	l	7	7	7	7
Expansion vessel charge	bar	0.75	0.75	0.75	0.75
District Temperature (80°C)					
Primary flow rate	l/s	0.24	0.24	0.16	0.16
Primary return temperature	°C	21.1	21.1	22.2	22.2
Primary pressure drop	kPa	41.3	56.4	19.9	26.8
DHW output (50°C @ 40K rise)	kW	58.6	58.6	39.1	39.1
DHW flow rate (50°C @ 40K rise)	l/min	21	21	14	14
District Temperature (70°C)					
Primary flow rate	l/s	0.25	0.25	0.17	0.17
Primary return temperature	°C	20.8	20.8	21.8	21.8
Primary pressure drop at 65/21	kPa	45.1	61.5	21.8	29.4
DHW output (45°C @ 35K rise)	kW	51.3	51.3	34.2	34.2
DHW flow rate (45°C @ 35K rise)	l/min	21	21	14	14
District Temperature (65°C)					
Primary flow rate	l/s	0.23	0.23	0.16	0.16
Primary return temperature	°C	18.6	18.6	19.5	19.5
Primary pressure drop	kPa	37.4	51.0	17.9	24.2
DHW output (40°C @ 30K rise)	kW	44.0	44.0	29.3	29.3
DHW flow rate (40°C @ 30K rise)	l/min	21	21	14	14
Electrical					
Electrical power supply voltage	AC...V	230	230	230	230
Frequency	Hz	50	50	50	50
Maximum power consumption	W	41.3	41.3	41.3	41.3
Standby power consumption	W	3.1	3.1	3.1	3.1
Appliance protection rating	IP	X4D	40	X4D	40

Table 5

1) Nominal output to domestic hot water values are for a temperature rise of 40K.

Description	Units	HIU E	HIU E with heat meter	HIU	HIU with heat meter
General					
Height	mm	700	700	700	700
Width	mm	440	440	440	440
Depth	mm	270	270	270	270
Total unit weight (lift weight)	kg	31	31	31	31
Packaged unit weight	kg	34	34	34	34
Minimum inlet pressure to achieve nominal DHW flow rate	bar	1.5	1.5	1.5	1.5
Nominal output to domestic hot water[1)]	kW	39.1	39.1	39.1	39.1
Output range to central heating	kW	1.5 - 15	1.5 - 15	1.5 - 15	1.5 - 15
Maximum flow temperature secondary heating	°C	80	80	80	80
Maximum flow temperature DHW	°C	60	60	60	60
District heating flow and return connections (compression)	mm	22	22	22	22
Secondary heating flow and return connections (compression)	mm	22	22	22	22
Cold feed and DHW connections (compression)	mm	15	15	15	15
Pressure relief valve connection	mm	15	15	15	15
Maximum district limited flow rate with integrated DPCV	l/s	0.355	0.355	N/A	N/A
Maximum working pressure district heating side	bar	10	10	10	10
Pressure relief valve setting secondary heating side	bar	3	3	3	3
Maximum working pressure domestic hot water side	bar	10	10	10	10
pH value (district water supply), approximate		7-9	7-9	7-9	7-9
Expansion vessel	l	7	7	7	7
Expansion vessel charge	bar	0.75	0.75	0.75	0.75
District Temperature (80°C)					
Primary flow rate	l/s	0.16	0.16	0.16	0.16
Primary return temperature	°C	22.2	22.2	22.2	22.2
Primary pressure drop	kPa	19.9	26.8	12.1	19.1
DHW output (50°C @ 40K rise)	kW	39.1	39.1	39.1	39.1
DHW flow rate (50°C @ 40K rise)	l/min	14	14	14	14
District Temperature (70°C)					
Primary flow rate	l/s	0.17	0.17	0.17	0.17
Primary return temperature	°C	21.8	21.8	21.8	21.8
Primary pressure drop	kPa	21.8	29.4	13.3	20.9
DHW output (45°C @ 35K rise)	kW	34.2	34.2	34.2	34.2
DHW flow rate (45°C @ 35K rise)	l/min	14	14	14	14
District Temperature (65°C)					
Primary flow rate	l/s	0.16	0.16	0.16	0.16
Primary return temperature	°C	19.5	19.5	19.5	19.5
Primary pressure drop	kPa	17.9	24.2	11.0	17.3
DHW output (40°C @ 30K rise)	kW	29.3	29.3	29.3	29.3
DHW flow rate (40°C @ 30K rise)	l/min	14	14	14	14
Electrical					
Electrical power supply voltage	AC...V	230	230	230	230
Frequency	Hz	50	50	50	50
Max. power consumption	W	41.3	41.3	41.3	41.3
Standby power consumption	W	3.1	3.1	3.1	3.1
Appliance protection rating	IP	X4D	40	X4D	40

Table 6

1) Nominal output to domestic hot water values are for a temperature rise of 40K.

2.12 Function Schematic

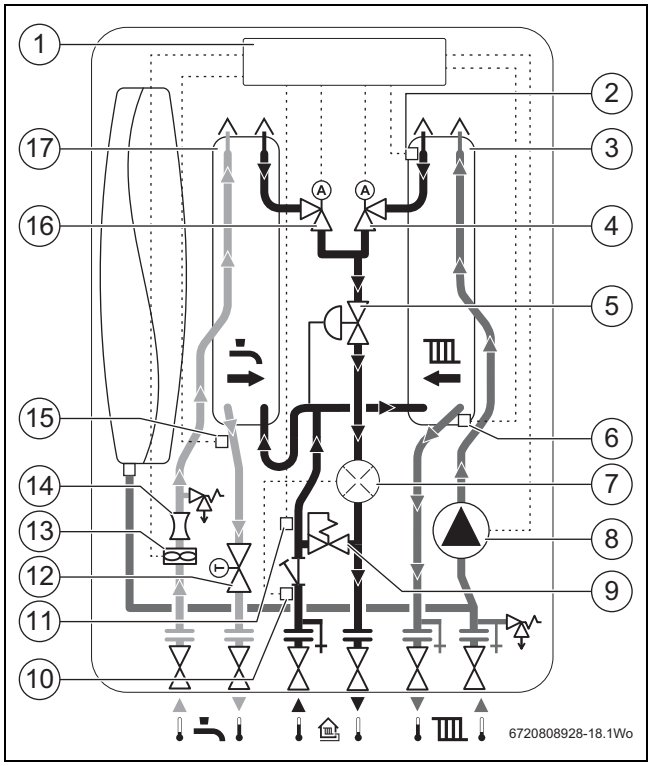


Fig. 8 Function schematic

[1] Control unit
[2] Return sensor NTC (district heating)
[3] Central heating plate heat exchanger
[4] Central heating control valve
[5] Differential pressure control valve (if fitted)
[6] Flow sensor NTC (central heating)
[7] Heat meter (if fitted)
[8] Circulating pump
[9] Summer by-pass valve (if fitted)
[10] Heat meter flow sensor connection point
[11] Supply sensor NTC (district heating)
[12] Domestic Hot Water safety valve
[13] Flow turbine
[14] Flow regulator
[15] Domestic Hot Water outlet sensor NTC
[16] Domestic Hot Water control valve
[17] Domestic Hot Water plate heat exchanger

System description

If a summer by-pass valve [9] is fitted; in stand-by mode, the district supply water flows from the district heating main, via the thermostatic by-pass valve, therefore ensuring that hot water at 45 °C - 50 °C is immediately available at the heat interface unit. This ensures a fast warm-up of hot water at the tap, often referred to as keep hot function.

The electronic control unit [1] provides fully modulated heating and hot water control between maximum and minimum heat output. There are two LEDs located on the top of the control unit [1] (visible through two viewing holes in the top of the case). These indicate operating modes and fault conditions.

Control unit LED indicators

- When an obstruction e.g. a shelf is positioned above the unit it may be difficult to see the LED indicators.

If a hot water tap is opened, the flow turbine [13] is activated, the central heating control valve [4] remains closed and the domestic hot water control valve [16] modulates, allowing district supply water to flow through the domestic hot water heat exchanger [18] to maintain the pre-set hot water outlet temperature, which is measured using a NTC sensor[15].

A domestic hot water safety shut-off valve [12] is provided in order to interrupt the hot water flow to the tap in the event of excessive hot water temperatures due to a failure condition. The domestic hot water outlet temperature is adjustable between 30 °C - 60 °C on the heat interface unit control unit [1].

During a central heating demand, the domestic hot water control valve [16] remains closed and the central heating control valve [4] modulates, allowing district water to flow through the central heating heat exchanger [3] to maintain the pre-set central heating flow temperature which is measured using a NTC sensor [6]. A low energy self regulating pump [8] is used to provide water circulation through the central heating circuit. The central heating flow temperature is adjustable between 30 °C - 80 °C on the heat interface unit control [1].

The district heating return temperature is measured using a NTC sensor [2].The control unit [1] will automatically modulate the central heating delivery to ensure low return temperatures back to the district network. The district return temperature will be kept below the central heating flow temperature. This function prevents the HIU working in case the district flow and return connections are reversed.

The default district heating return temperature is 50 °C.

The heat interface unit can operate up to a supply differential pressure of 80kPa (800mbar). For supply differential pressures above 80kPa (800mbar), a differential pressure control valve [5] should be fitted. This provides a controlled differential pressure of 30kPa (300 mbar) across the heat interface unit as the supply differential pressure varies up to a maximum of 400kPa (4000mbar), the Worcester KE Plus, E Plus and E HIU's incorporate a DPCV as standard.

Worcester KE Plus with by-pass valve

- The maximum supply differential pressure is 400kPa (4000mbar)

3 Regulations

3.1 General

The special rules must be followed for buildings where the appliance is installed.

The installation and maintenance of the unit must be performed by a qualified person in accordance with regulations and rules of the local area where installation is to take place.

3.2 Standards and Guidelines

Observe all rules, regulation, standard and guidelines applicable to the installation and operation of the appliance in your country.

When installing and operating, please refer to country-specific regulations and standards, note in particular:

- ▶ The local standards and regulations on the installation conditions.
- ▶ The provision for the electrical connection to the power supply.
- ▶ The standards and regulations relating to the safety equipment of the water heating system.
- ▶ The standards and regulations relating to the connection of drinking water.

3.3 Inspection and maintenance

The heating system should be inspected regularly for the following reasons:

- To achieve and maintain a high efficiency.
- To ensure operational safety.

The recommendation from BSRIA BG62/2015 is a maintenance check every 3 years should be sufficient.

NOTICE: Risk of system damage!
Damage to the system caused by a lack of, or insufficient cleaning and servicing.

- ▶ Ensure that the heating system is inspected regularly by an authorised heating engineer.
- ▶ Carry out any repairs immediately to avoid any damage to the system.

4 Pre-installation requirements

4.1 General

NOTICE: Differential pressures above 80kPa (800mbar) when no internal DPCV is fitted.
High differential pressure could affect the performance of some components in the unit.

- ▶ Fit a differential pressure control valve to protect the unit.
- ▶ The maximum allowable supply differential pressure when the internal differential pressure control valve is fitted is 400kPa (4000mbar).

It is recommended to insulate all service pipe work to the heat interface unit in order to reduce heat losses and improve system efficiency.

4.2 System preparation

Water system and pipe-work

- Any plastic pipe-work used on the central heating system must have a polymeric oxygen barrier coating and at least 1000mm length of copper or steel pipe connected to the appliance.
- Plastic pipe-work used for under-floor heating must be correctly controlled and must not exceed the under-floor manufacturers' specifications.
  - With a single under-floor heating zone this may be able to be controlled by the HIU provided the under-floor heating design does not exceed the hydraulic capacity of the HIU internal circulating pump, refer to section 6.6, Central heating circulation pump.
- The district circuit is completely separated from the central heating circuit by the use of a plate heat exchanger. However, in order to protect the under-floor circuit in the event of a failure condition, a limiter thermostat must be fitted onto the flow pipe to the under-floor circuit and wired into the control unit (→ figure 6). This switches off the central heating pump in the event of an over temperature condition.
- A single under-floor heating circuit can be controlled without the need for an external mixing valve.

The switching point of the limiter thermostat, and if fitted a thermostatic blending valve must be set at the temperature set point + 10K for the under-floor heating circuit.

The minimum flow temperature of the appliance is 30 °C.

NOTICE: Under-floor heating circuits.
Damage caused by excessive flow temperature.

- ▶ Ensure the flow temperature does not exceed the requirements of the under-floor heating circuit manufacturer.

Secondary circuit/connections/valves

- All system connections, taps and mixing valves must be capable of sustaining a pressure of 3 bar.
- Radiator valves should conform to local regulations.
- A thermostatic radiator valve (TRV) must be fitted to radiators in all rooms except the room with the room thermostat. This must be fitted with lock-shield valves and left open.
- Drain cocks are required at all the lowest points on the system.
- Air vents are required at all high points on the system.

4.3 Domestic water supply

Use in hard water areas

Normally there is no need for water treatment to prevent scale formation as the maximum temperature of the DHW heat exchanger is limited by the electronic control.

In areas where temporary water hardness exceeds 200 ppm, consideration may need to be given to the fitting of a scale prevention device. In such circumstances, the advice of the local water authority should be sought.

Showers/bidets:

- Ensure that the shower is suitable for use with mains water pressure.
- If a shower head can be immersed in water or comes closer than 25mm from the top edge of a bath or shower tray spill over level then an anti-siphon device must be fitted to the shower hose.
- Bidets with direct hot and cold mains water can be used (with the approval of the local water authority) and must be the over rim flushing type with shrouded outlets to prevent the fitting of hand held sprays.

Water mains pressure

- Minimum inlet pressure to achieve nominal DHW flow rate
  - 58.6kW units - 2.0 bar
  - 39.1kW units - 1.5 bar
- Maximum mains fed water pressure 10 bar.
  - If necessary fit a pressure reducing valve.
- Where the mains water supply has a non-return, back flow prevention valve fitted, a mini expansion vessel should be connected to the mains water inlet pipe between the non-return valve and the appliance.

NOTICE: Risk of damage to household appliances!
Non-return, back flow prevention devices (including those associated with water meters) fitted to the mains water supply can cause a pressure build up which could damage the appliance and other household appliances.

▶ Fit a mini expansion between the non-return valve, back flow prevention device.

4.4 Pressure relief pipe work

WARNING: Risk of scalding!
Injury if discharge pipe is not routed correctly.

▶ The pressure relief valve is a safety device for the appliance and if activated may discharge boiling water or steam through the relief valve drain pipe.

▶ Care should be taken when siting the outlet pipe so that it does not cause an obstruction or discharge above a window, entrance or other public access where it could cause a hazard.

Refer to figure 9

- The pressure relief drain pipe [1] and [3] from the appliance should be at least 15mm diameter copper pipe and run downwards to a safe point of discharge, away from any electrical equipment or other hazard, preferably to an external drain or soak away.
- Pipe [1] should be finished with a partial bend, near the outlet to face the external wall (as shown) to help prevent freezing.

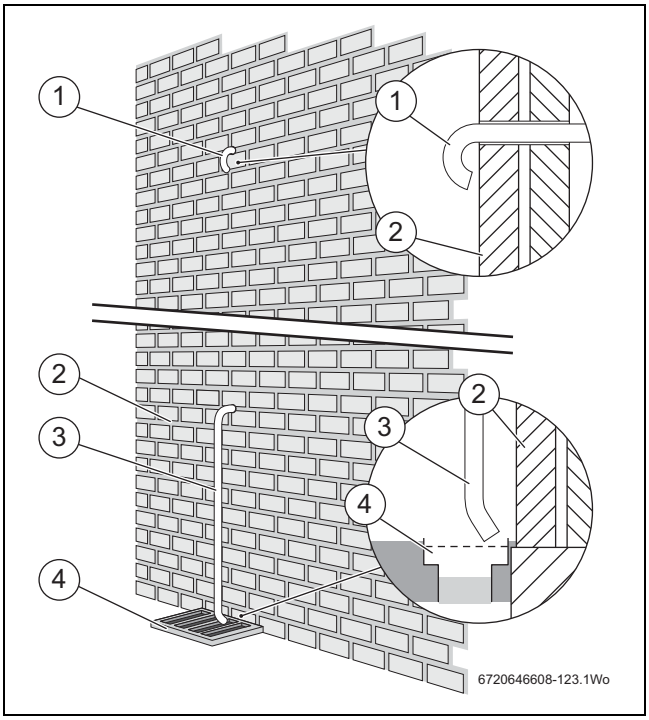


Fig. 9 Pressure relief pipe-work external routing

[1] Outlet facing external wall
[2] External wall
[3] Outlet to external drain
[4] External drain

Internal PRV discharge

The PRV discharge pipe may terminate internally to a safe position such as a waste pipe or soil pipe, provided that the following conditions are met:

- The material used must be capable of taking the maximum temperature provided by the District Heating primary flow.
- The discharge must be directly or indirectly visible and will not discharge onto the occupants of the premises or onto any electrical wiring or components. An example of "directly" is a tundish and "indirectly" an audible indication of pressure loss.
- There is a continual fall towards the discharge point from the HIU.
- Where a tundish is used, a suitable trap is installed to protect against foul smells entering into the living areas, whilst ensuring no undue resistance to the discharge. An example would be a washing machine trap with upstand.
- For the higher district flow temperatures above 85 °C, It is recommended to use the Hotun Hiflo tundish manufactured by RA Tech UK. Guidance on this product can be found at http://hutun.co.uk.
  - We would also recommend that the Hotun Shield is used in conjunction with the Hotun Hiflo on HIU installations. The Hotun Hiflo tundish can also be used for providing a visual indicator which will allow connection of a PRV directly into internal waste pipes or soil stacks.

4.5 Cleaning primary system

NOTICE: Risk of damage to system or appliance!
Debris from the system can damage the appliance and reduce efficiency. Failure to comply with the guidelines for the use of water treatment with the appliance will invalidate the appliance guarantee.

- ▶ Before installation, ensure that the central heating system is cleaned and thoroughly flushed in accordance to the standards and guidelines of the country of installation.

4.6 Appliance locations and clearances

4.6.1 Location

- Follow local regulations for the location within the property that the appliance is to be installed.
- This appliance is only suitable for installing internally within a property at a suitable location onto a fixed rigid surface at least the same size as the appliance and capable of supporting the appliance weight.
- The appliance is not suitable for external installation.

No surface protection is required against heat transfer from the appliance.

NOTICE: Appliance damage.
Damage caused by extreme temperatures.

- ▶ Ensure the ambient temperature is above 2 °C and below 30 °C.

NOTICE: System damage.
Very cold temperatures can cause the heating system to freeze, if there is a power failure or a fault in the system the units frost protection function (→ section 5.4) will be compromised.

- ▶ Do not fit the appliance in areas with no heat emitters, e.g. garage.
- ▶ Drain the central heating system if it is to be shut down for an extended period.

4.6.2 Rooms containing a bath or a shower

NOTICE: Risk of electric shock

- ▶ Any switch or appliance control using mains electricity must not be within reach of a person using the bath or shower.

- In all cases the installation **must be in accordance with the latest amendments to the latest edition of the IET Wiring Regulations (BS7671)**.
- The IP rating of the appliance.
  - **Units without internal heat meter, IPX4D.**
    The IP rating of the appliance allows it to be installed in, and outside of, zone 2.
  - **Unit with internal heat meter, IP40.**
    The IP rating of the appliance dictates that it must be installed outside of zone 2.
- Circuit breaking devices should be used in accordance with the regulations.
- The diagram is for guidance only.

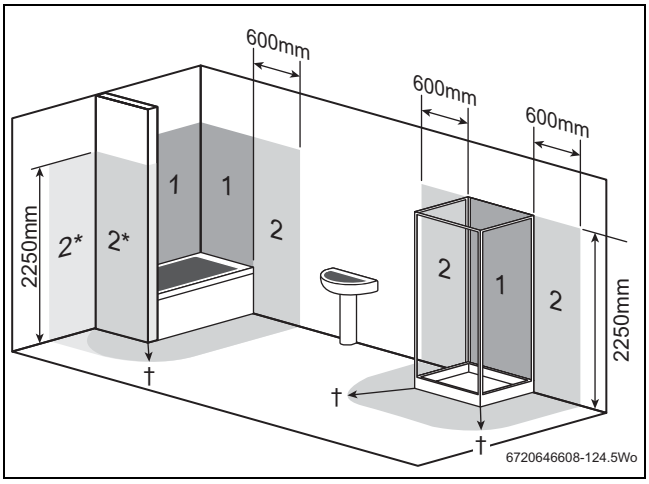


Fig. 10 Installations in rooms containing a bath or a shower

[2*] Without the end wall, zone 2 must extend 600mm from the bath.
[†] Radius 600mm.

4.6.3 Installation and maintenance Clearances

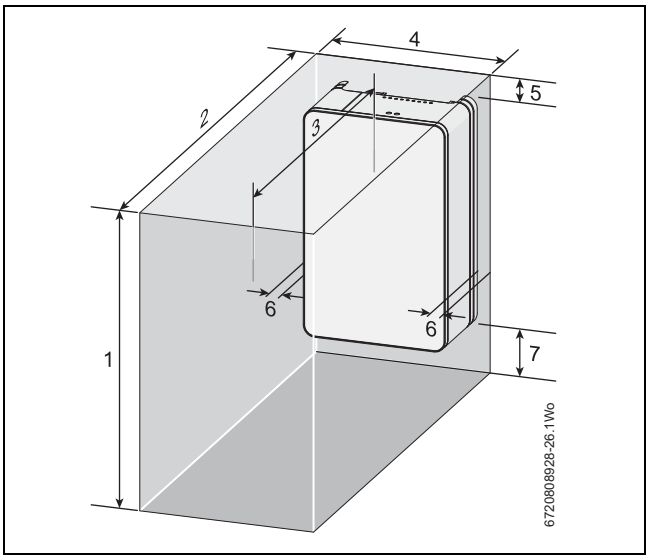


Fig. 11 Minimum installation and maintenance clearances

Minimum Installation and Maintenance clearances		
	Description	**Dimensions (mm)**
1	Overall clearance height	930
2	Overall clearance depth	870
3	In front of appliance	600
4	Overall clearance width	450
5	Above the appliance	30
6	Either side of appliance	5
7	Below the appliance	200

4.6.4 Compartment clearances

If the appliance is to be fitted in a compartment, the following minimum clearances for the compartment dimensions apply. This is in addition to the normal installation and servicing clearances.

- All service pipe work to the heat interface unit MUST be insulated when installed within a ventilated compartment.
- If the ambient temperature within the compartment exceeds 30 °C then it is recommended to make provision for ventilation.
  - Ventilation openings must be provided at the front of the compartment at the lower and upper positions. Each opening must have a minimum size of 300mm by 80mm, 240cm^2 free area.

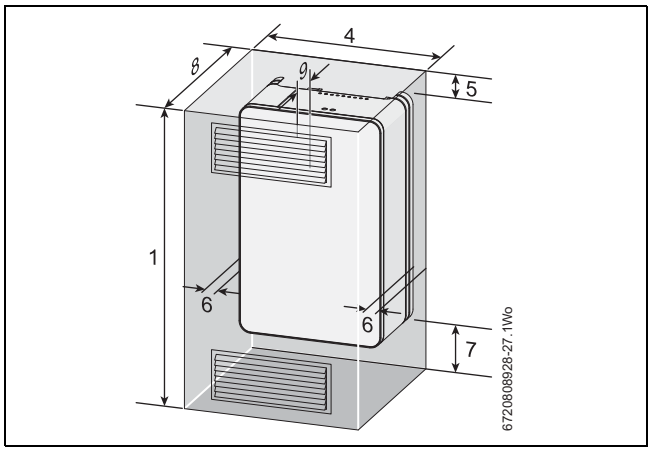


Fig. 12 Minimum compartment clearances

Minimum Installation and Maintenance clearances		
	Description	**Dimensions (mm)**
1	Compartment height	930
4	Compartment width	450
5	Above the appliance	30
6	Either side of appliance	5
7	Below the appliance	200
8	Compartment depth	290
9	Appliance to removable door	20

4.7 Example layouts

4.7.1 Unmixed central heating with radiators

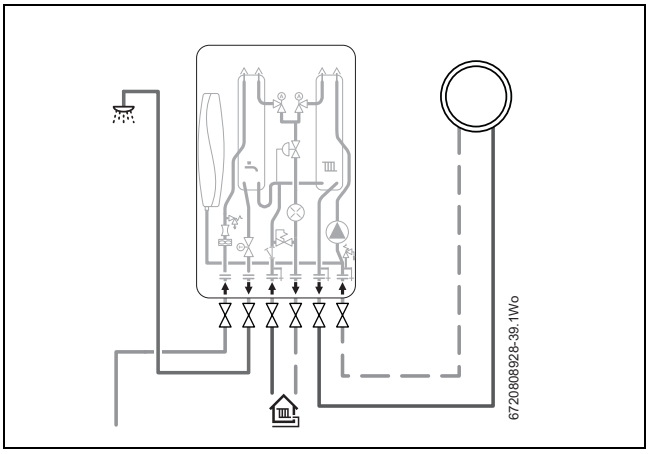


Fig. 13

Control of radiator heating system with 230V programmable room thermostat

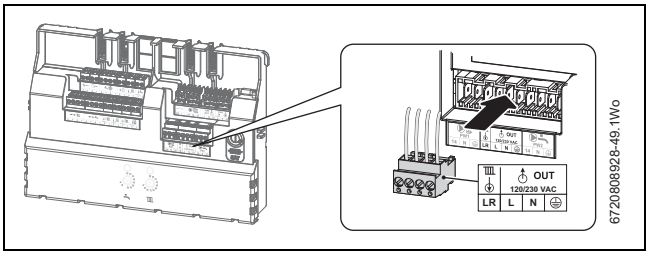


Fig. 14

Connections/ Symbol	Function
OUT 120/230 VAC LR L N ⏚	230 V feed to external time and temperature control • 230V programmable room thermostat – Switch live demand input [LR] – Live output [L] – Neutral output [N] – Earth output [⏚]

4.7.2 Unmixed central heating with under-floor

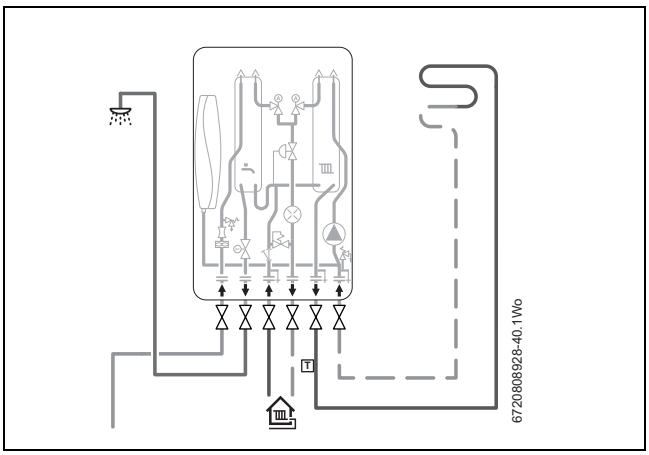


Fig. 15

Control of under-floor with 230V programmable room thermostat

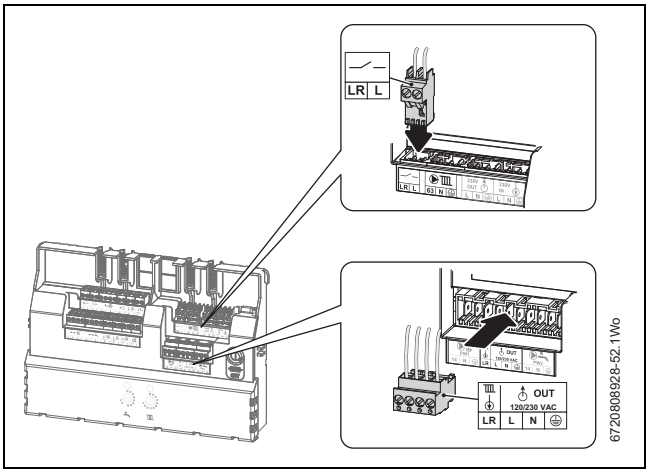


Fig. 16

Connections/ Symbol	Function
LR L	Limiter thermostat (under-floor safety cut-off) • Potential free
OUT 120/230 VAC LR L N ⏚	230 V feed to external time and temperature control • 230V programmable room thermostat – Switch live demand input [LR] – Live output [L] – Neutral output [N] – Earth output [⏚]

4.8 Mounting frame

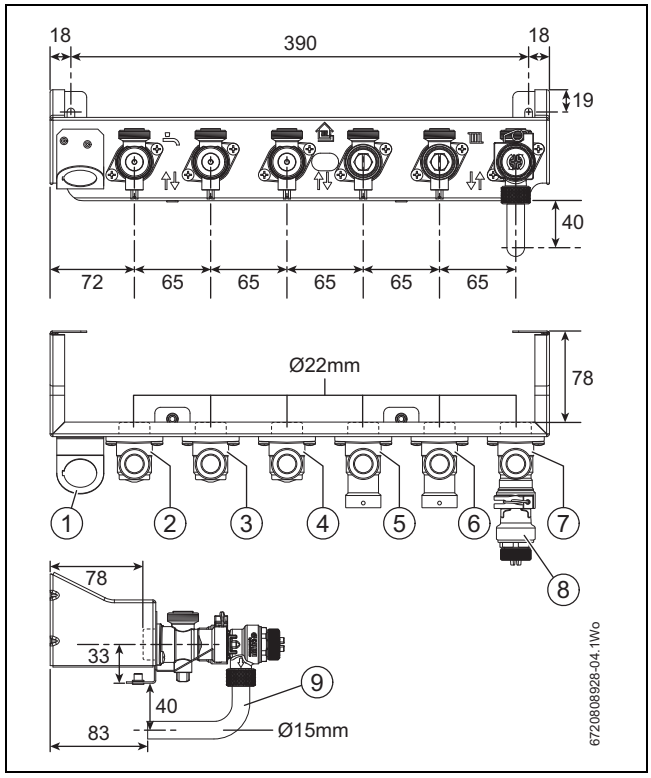


Fig. 17 Pipe positions

[1] Optional position for pressure gauge
[2] Cold mains in (22mm compression fitting)
[3] Domestic Hot Water out (22mm compression fitting)
[4] District heating supply (22mm compression fitting)
[5] District heating return (22mm compression fitting)
[6] Central heating flow (22mm compression fitting)
[7] Central heating return (22mm compression fitting)
[8] Pressure relief valve (15mm elbow fitting)
[9] Pressure relief discharge pipe (15mm)

5 Installation

5.1 Support bracket and mounting frame fitting

NOTICE: Damage to property!
Damage caused by drilling into pipes, electrical cables, damp proof course or other hazards.
- ▶ Before drilling ensure that there are no obstructions or other hazards.

5.1.1 Wall mounting template

The wall mounting template has been sized to allow for minimum clearances of 5mm sides, 200mm base and 30mm above appliance case.

- The appliance wall mounting template shows the relative positions of the pipe-work connections, the support bracket and mounting frame fixings.
- ▶ Fix the wall mounting template to the wall [1] in the desired position.
- ▶ Drill the fixing holes [2] for the support bracket indicated on the wall template.
- ▶ Drill the fixing holes [3] for the mounting frame indicated on the wall template.
- ▶ Remove the wall mounting template.

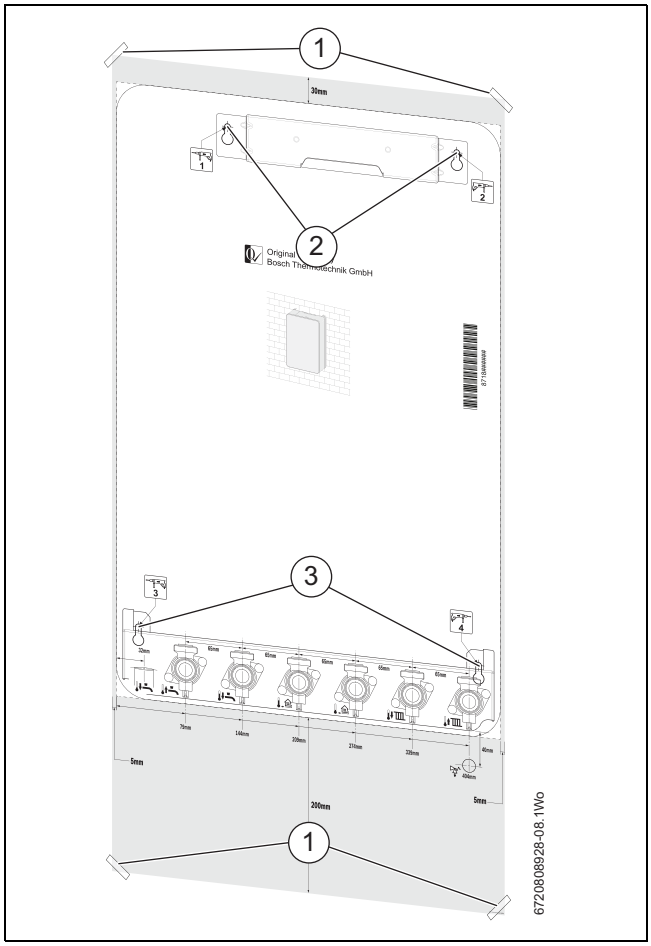


Fig. 18 Template

5.1.2 Fitting support bracket and mounting rail

- ▶ Secure the support bracket [4] to the wall, with appropriate fittings [5] for appliance weight and wall type.
- ▶ Secure the wall mounting frame [6] to the wall, with appropriate fittings [5] for appliance weight and wall type.
- ▶ Fit the pressure relief valve installer connector elbow [7] to the pressure relief valve outlet.
  - – The connection elbow nut will be inside the casing when installed allowing the pipe to drop below the bottom of the casing for installation of discharge pipe-work.

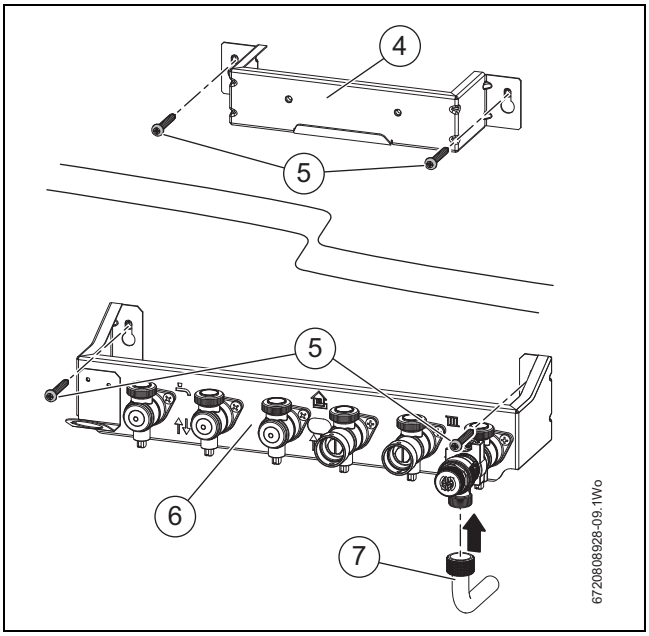


Fig. 19 Support bracket and mounting rail

- ▶ Install and connect the pipe-work to the isolation valves on the mounting frame and tighten the compression fittings, supplied in the installation pack.

5.1.3 Example pipe-work installation.

The pipe-work to the appliance can be installed from below, above and a mix of both.

A vertical pipe kit is available as an accessory, shown in figure 20.

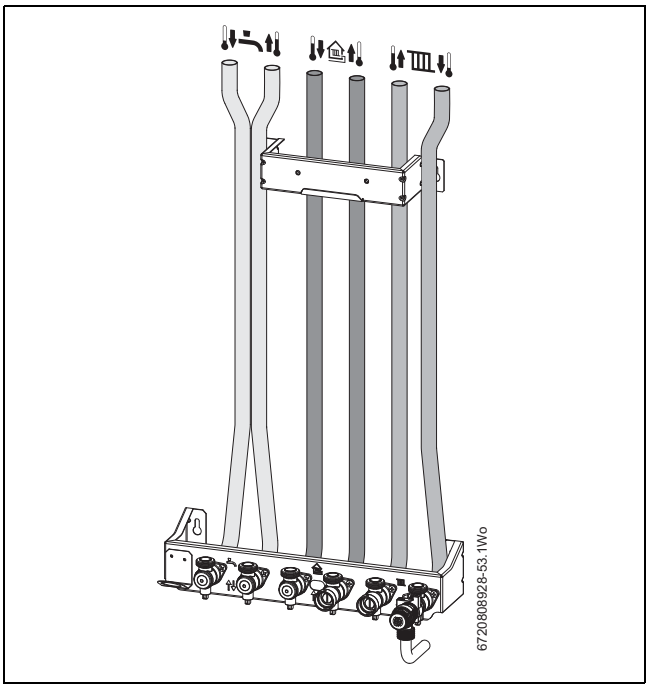


Fig. 20 Pipe kit example

5.1.4 Fitting the filling link assembly

Fit the Integral filling link, supplied with the appliance, before hanging the appliance on the frame.

- The district water is treated and used to protect the central heating system when this filling method is used, → section 6.8,Water quality for details on typical additives used.

Refer to figure 21

- Ensure the isolation valves are closed on the district heating return [1] and central heating flow connections [3].

NOTICE: There may be mains and system water pressure behind the blanking plugs.

- Ensure all isolation valves are closed.

- Unscrew the blanking plugs [4] from the district heating return [1] and central heating flow connections [3].
- Fit the filling link filter and "O" ring seals.
  - Place the filter [7] inside the inlet of the filling link, ensuring that the mesh is inside the filling link assembly [6].
  - Fit the "O" ring seals [5] onto the inlet and the outlet of the filling link assembly [6].
- Fit the filling link assembly onto the district heating return [1] and central heating flow connections [3].
  - Ensure that the filling link [6] is pushed in fully to the locating tabs [8] on both sides of the assembly.
- Fit the securing screws and lock washers [2] in each of the isolation valves.

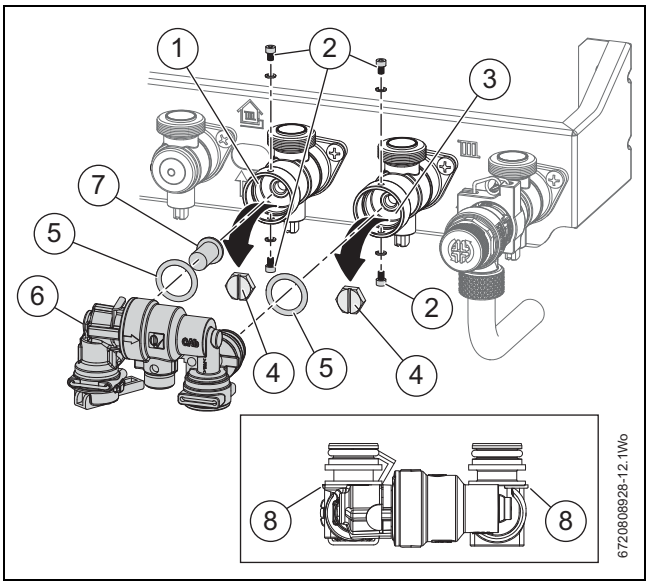


Fig. 21 Filling link fitting

5.1.5 Fitting an external filling link (not supplied with appliance)

The cental heating sealed system must be filled using a WRAS approved filling loop, example configurations shown in figures 22 and 23.

District return filling link option

The district water is treated and used to protect the central heating system when this filling method is used, → section 6.8, Water quality for details on typical additives used.

- Fit the filling loop across the district return and central heating flow pipes.

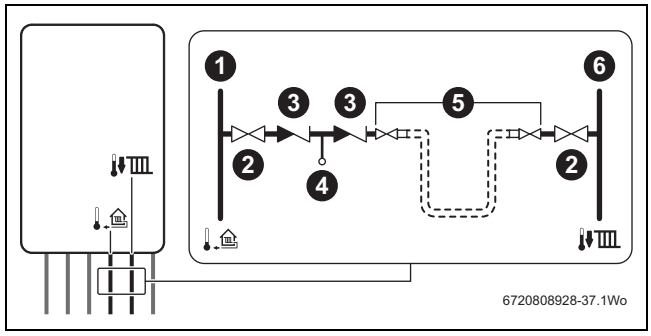


Fig. 22 External system fill example -district return

[1] District Return pipe
[2] Stop valve
[3] Check valve
[4] Test point
[5] Hose union
[6] Central heating flow pipe

Cold mains inlet filling link option

NOTICE: Risk of damage to system or appliance!
Cold mains water filling method uses untreated water to fill the central heating system.

- Ensure that the central heating system is treated with appropriate inhibitor, → section 6.8, Water quality for details on typical additives that can be used.

- Fit the filling loop across the Cold mains inlet and central heating flow pipes.

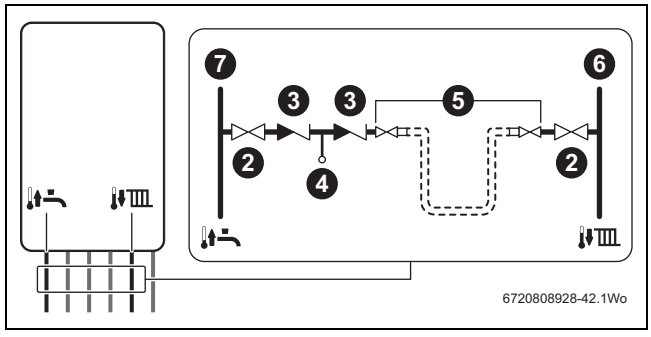


Fig. 23 External system fill example - cold mains inlet

[2] Stop valve
[3] Check valve
[4] Test point
[5] Hose union
[6] Central heating flow pipe
[7] Cold mains inlet pipe

5.1.6 Flushing valve accessory installation

A close-coupled flushing by-pass valve accessory is available and can be fitted behind the mounting frame directly into the district heating supply and return connections.

The flushing valve [1] can be fitted with district pipe work connections installed upwards for behind the appliance piping or downwards for below piping configurations.

▶ Connect the flushing valve [1] across the district heating supply and return connections in the orientation required.

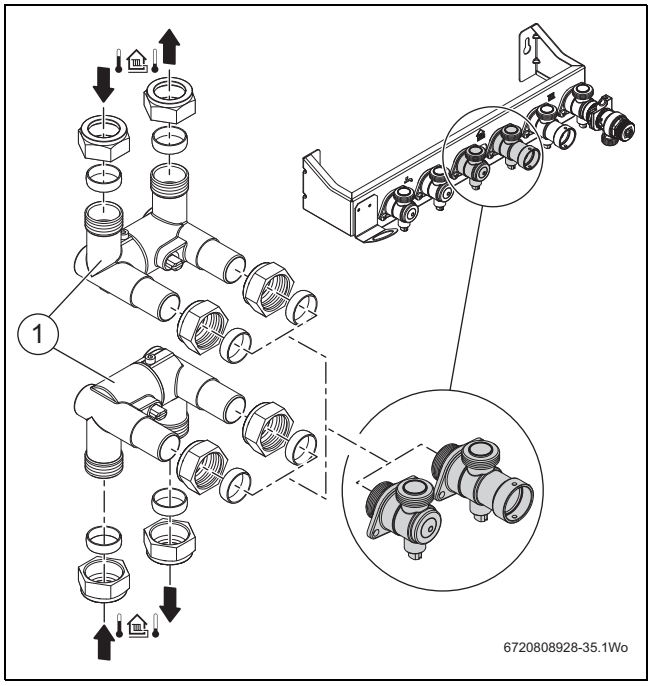


Fig. 24 Flushing valve accessory fitting

5.1.7 Flow regulating valve (not supplied with appliance)

NOTICE: The pressure differential across the primary circuit of the heat interface unit must not exceed 80kPa (800mbar) on units without a DPCV (differential pressure control valve) as standard.
For units with internal DPCV (differential pressure control valve) fitted, the maximum differential pressure is 400kPa (4000mbar).

▶ A suitable means of control should be installed to limit the differential pressure if the system design is expected to exceed the limits above (depending on the HIU model).

If the system design deems necessary, a Flow regulating valve (with pressure test points at inlet and outlet) should be fitted and be located in the district return pipe work at each Heat Interface Unit

- The function of the Flow regulating valve is to ensure that the correct nominal flow rate is achieved at each Heat Interface Unit.
- By measuring the differential pressure across the regulating valve, this can be converted into the corresponding district flow rate using charts supplied by the manufacturer of the valve.

▶ If required the Flow regulating valve either; in the district return pipe work [1] running up behind the appliance.

-or-

▶ In the district return pipe work [2] running down from the appliance.

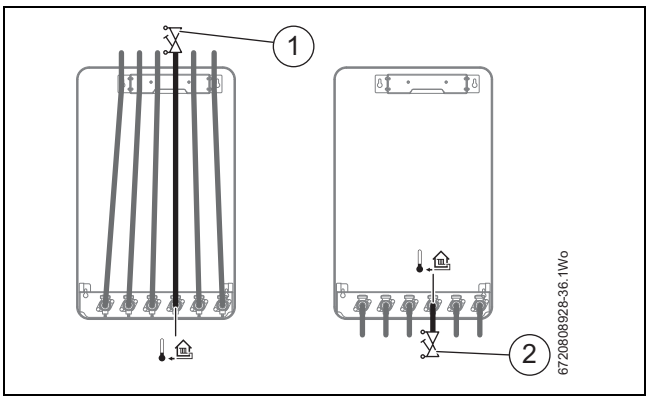


Fig. 25 Flow regulating valve position

5.1.8 Hydraulic connections on mounting frame

▶ Fit the sealing washers to the service valves before hanging the appliance.
  – Fibre washers [1] for the District and Central Heating connections.
  – Blue PTFE washers [3] for the Domestic water connections.

Optional pressure gauge bracket [2].

▶ The pressure gauge can be moved from under the expansion vessel and fitted in the optional bracket position [2] on the mounting rail.

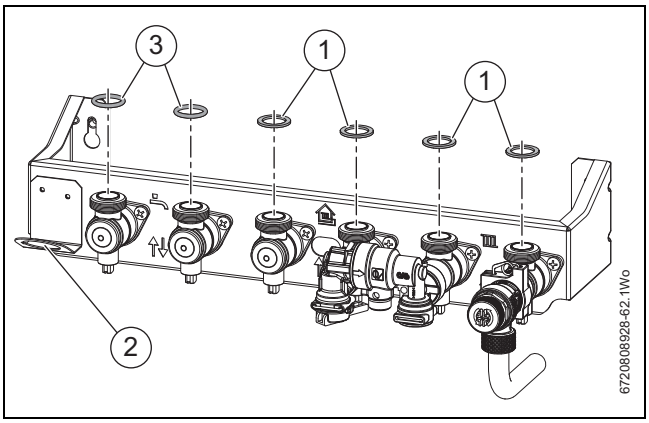


Fig. 26 Service valves sealing washers

5.2 Hanging the appliance

Installing the main unit

- ▶ Lift and locate the hanging point [1] of the appliance onto the centre hook [3] on the support bracket [2].
  - – Ensure the pipe connections fit into the isolation valve connections.
- ▶ Ensure the unit is level and engaged on the support bracket, loosely fit isolation valve connections [4].
- ▶ Tighten the isolation valve connections [4].

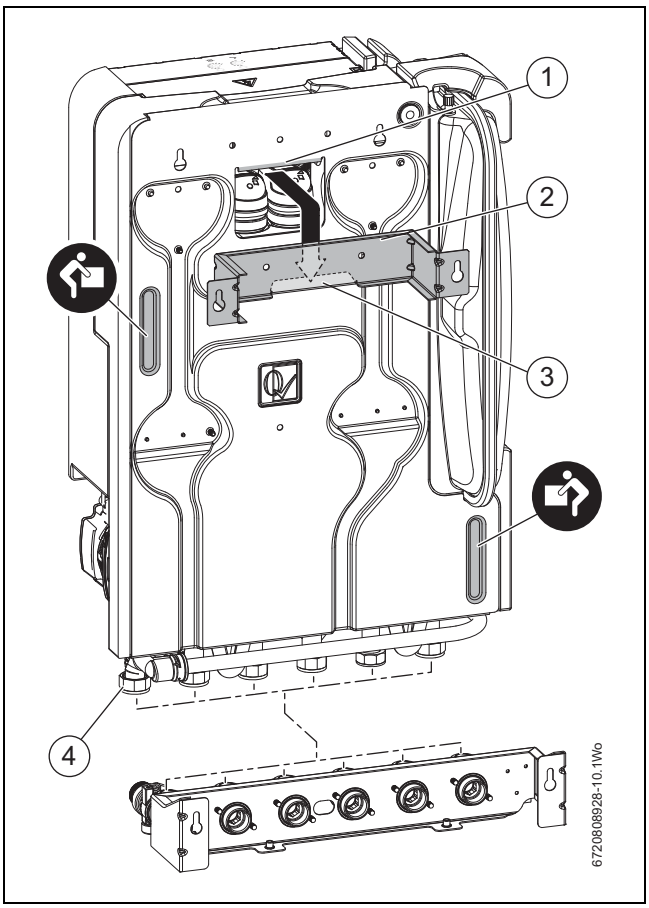


Fig. 27 Installation of main unit

5.3 Electrical

DANGER: Risk of electric shock!

- ▶ Before carrying out any work on electrical components, isolate them from the power supply (230 V AC) (fuse, circuit breaker) and secure against unintentional re-connection.
- ▶ Information on safe isolation can be found in the Health and Safety Executive Guidance HSG85.
- ▶ Using test equipment approved to GS38 confirm that the electrical supply is disconnected.

Electrical considerations

- ▶ All electrical work must be carried out by a competent and authorised person.
- ▶ All work must be in line with country specific and local standard and regulations.
- ▶ Supply: 230V AC - 50Hz
- ▶ This appliance must **not** be connected to a three phase supply.
- ▶ The wiring between the appliance and the electrical supply must comply with the latest IET wiring regulations that apply to wiring a fixed appliance.
- ▶ Type A RCDs ⏦ must be employed where additional protection is required.
- ▶ External fuse 5 Amps to BS1362.
- ▶ The appliance must be earthed.
- ▶ The isolator must have contact separation of 3mm minimum between poles. Any system connected to the appliance must not have a separate electrical supply.
- ▶ Pre wired mains cable supplied.
- ▶ When stripping the wires ensure copper strands do not fall into the control box.

DANGER: Risk of fire from hot appliance components. Hot appliance components can damage electrical cables.

- ▶ Ensure all electrical cables are in the correct cable guides and away from hot appliance components.

Cable routing

- ▶ Route cables through the cut out behind the control box and down the back of the unit
- ▶ Run power cables separately from signal cables. Interference from power cables can induce spurious faults on signal cables, ensure that there is at least 100mm separation from each other.
- ▶ Ensure the cables are of sufficient length to allow the control box to be hung in the service position.

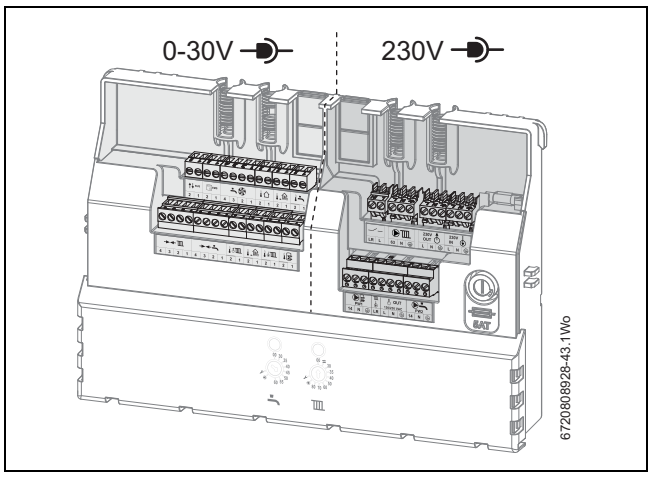


Fig. 28 Electrical connections

[0-30V] Low voltage (signal cables) connections side
[230V] Mains voltage (power cables) connections side

5.3.1 Pre wired mains cable

If the power cable is of insufficient length, access the connection terminal(→Section 5.3.3.)

- ▶ Replace with the following cable type:
  - H05V2V2F x 0.75 mm^2
- ▶ Connect the cable so that the protective earth conductor is longer than the other wires as per figure 32.
- ▶ Fit and secure cable according to section 5.3.4.

5.3.2 Installer connections

NOTICE: Risk of equipment damage

- ▶ Only 230V room thermostats or 230V programmable room thermostats can be used with the HIU units for external time and temperature control.
- ▶ The 230V time and temperature controls must only be wired to the HIU and not from an external 230V source.

Mains voltage (power cables) connections side

Connections/ Symbol	Function
LR L	Limiter thermostat (under-floor safety cut-off) • Potential free
230V OUT L N ⏚	230 V feed to external controls modules • Live output [L] • Neutral output [N] • Earth output [⏚]
230V IN L N ⏚	230 V supply to the appliance • Live output [L] • Neutral output [N] • Earth output [⏚]
PW2 14 N ⏚	Not used
OUT 120/230 VAC LR L N ⏚	230 V feed to external time and temperature control • Switch live demand input [LR] • Live output [L] • Neutral output [N] • Earth output [⏚]
PW1 14 N ⏚	Not used

Table 7

Low voltage (signal cables) connections side

Connections/ Symbol	Function
BUS 2 1	Not used
EMS 2 1	Not used
2 1	Not used
2 1	Not used

Table 8

5.3.3 Access to electrical connections:

Control box service position

- The control box [1] incorporates a hook on the underside to support the control unit on the plate heat exchanger top bracket [2] whilst working in the control unit.

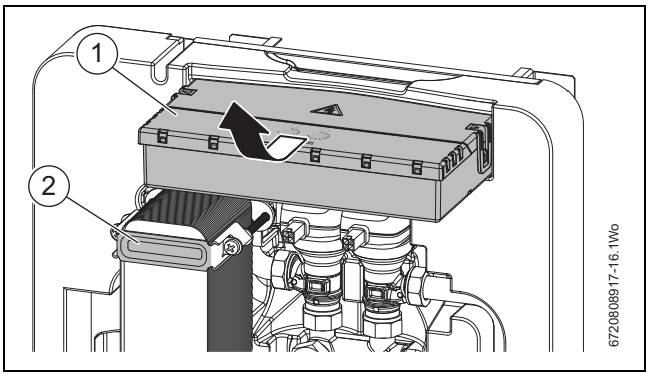


Fig. 29 Accessing electrical connections

- Release the latches [4] using a thin bladed screwdriver. Arrows on the electrical cover indicate the position where the screw driver must be inserted to release the catches.
- Hinge open the connections cover [3].
- Wire any mains voltage equipment (timers, room thermostats etc. in the appropriately marked connector) within the mains voltage connection points.

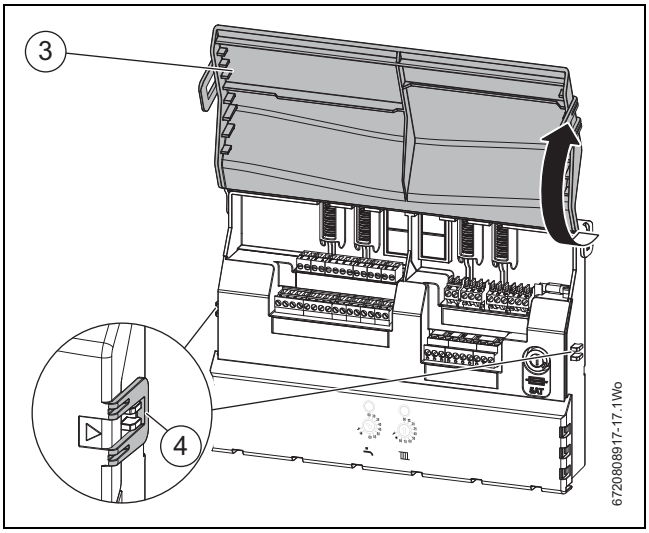


Fig. 30 Accessing electrical connections

5.3.4 Cable retainer clamps

Cable retainer clamps

- Each cable entering the control box must be placed and secured under a cable retainer.
- There are three strain reliefs per port, if there is insufficient room to reinsert the third one it can be discarded.

Accessing the cable retainer clamps

→ Figure 31

- Remove the electrical cover [1] by releasing the latches [2] using a thin bladed screwdriver.

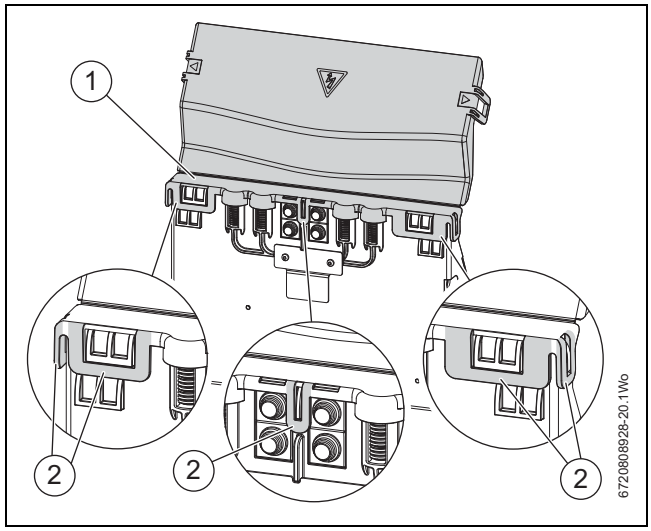


Fig. 31 Removing electrical cover

Cable preparations

NOTICE: Damage to control unit!
Small pieces of wire can cause shorts and damage to electronics.

- When stripping wires always ensure copper strands do not fall into the control box.

Mains voltage (power cables), example → Figure 32

- Ensure the protective conductor is longer than the other wires.

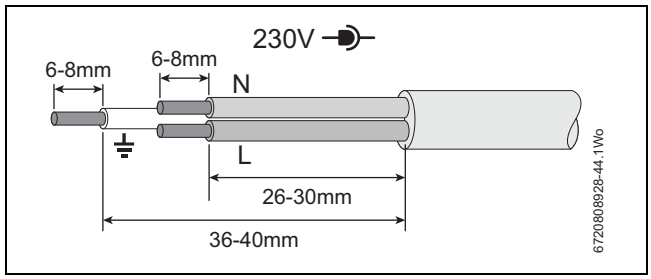


Fig. 32 Mains voltage (power cables) preparation

Low voltage (signal cables), example → Figure 33

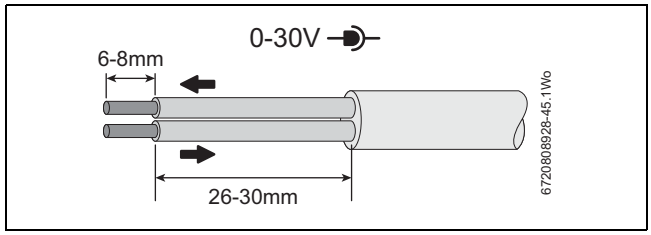


Fig. 33 Low voltage (signal cables) preparation

Securing the cables

→ Figure 34

- ▶ Unscrew the cable retaining screw [3].
- ▶ Feed the cable [4] through the cable clamp ensuring there is ample cable to reach the connectors.
- ▶ Tighten the cable retaining screw [3] to secure the cable.

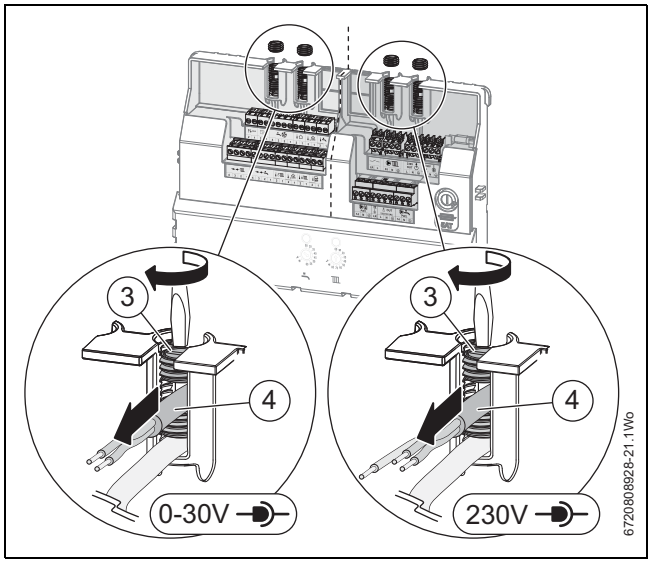


Fig. 34 Cable retainer clamps

[0-30V] Low voltage (signal cables) connections side
[230V] Mains voltage (power cables) connections side

- ▶ Replace the electrical cover, ensuring all latches are fitted correctly.

5.4 Frost protection

- Internal frost protection.
  - The central heating flow sensor detects a temperature below 8 °C, the central heating circulation pump is activated.
  - Additionally if the central heating flow sensor detects a temperature below 5 °C, the central heating control valve opens.

5.5 By-pass function

The by-pass function, sometimes called summer by-pass function or keep warm function, implements a feature to keep the supply side of the HIU hot. It is necessary to heat up the supply side pipe work after a long period of inactivity, this will minimise the time taken to produce hot water at the tap or radiator.

This function is provided by a thermo-mechanical by-pass [3] (→ Table 2, Model matrix for standard component or accessory), this allows circulation of the district water at the appliance.

Thermo-mechanical by-pass valve set temperature

- ▶ The thermo-mechanical by-pass valve is fixed to number 4 (approximately 45 °C).

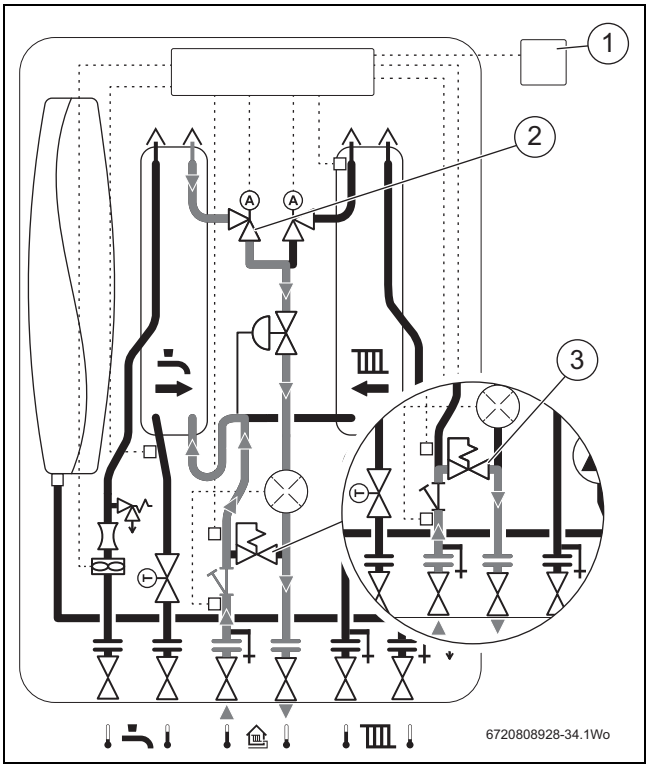


Fig. 35 By-pass functions

5.6 Limit return temperature

The limit return function helps to ensure high system efficiency.Since a high return temperature results in a lower efficiency for the heating supply company, there may be contractual financial penalties for customers when the return temperature is over a certain threshold. This situation can be avoided by limiting the hot water flow through the HIU, the return temperature is measured and the CH control valve closed if the return flow temperature is too high.

Although the limit return flow function is offered as a special HIU feature, it should not be necessary if the system is designed correctly. If high return temperatures are experienced it may be, for example, that the radiator surface areas are too small and not enough heat is transmitted into the room. If the limit return temperature function reduces the flow of hot water it may be that the required room temperature is not met.

The limit return temperature function is always active and ensures a highly efficient use of the energy. The default value for the return temperature is 50 °C.

6 Commissioning

6.1 Cleaning the primary circuit

Ensure the pipe-work systems connected to the heat distribution unit have been cleaned and flushed in accordance with the relevant standards and regulations.

Refer to BSRIA guide BG29 for further guidance on water quality requirements.

6.2 Flushing kit accessory

There is a flushing kit available as an accessory. This component connects between the district/centralised heat source, external to the appliance isolation valves. The benefit of this is that the primary circuit can be flushed separately without the HIU being connected directly to the primary circuit before the commissioning of the HIU.

To clean the newly installed pipe work between the appliance and the district services pipe work.

- ▶ Ensure the appliance district isolation valves are in the closed position to prevent any debris entering the HIU.
- ▶ Open the isolation valve on the flushing valve to flush the pipe work.
- ▶ Close the isolate valve once flushing is complete.

NOTICE: Reduced performance.
Flushing kit isolation valve left in the open position can lead to poor network performance.

- ▶ Close the isolation valve upon completion of flushing the primary circuit.

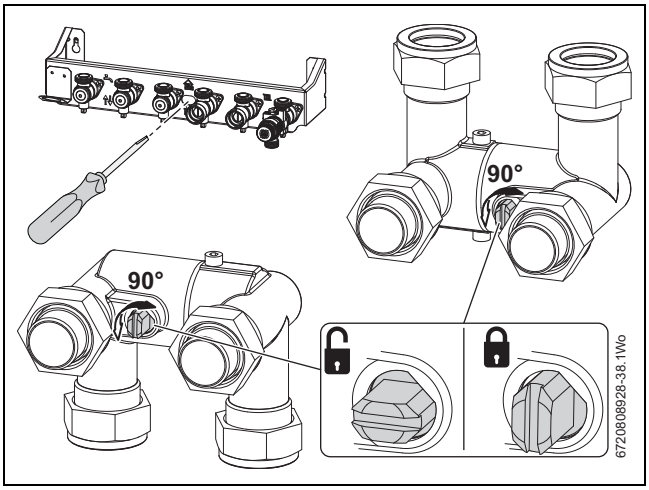


Fig. 36 Flushing kit

6.3 Filling and venting the unit

Control valves

- ▶ In order to completely open the control valve, service position can be used. This first calibrates the valve and then after 10 seconds opens the valve for 10 minutes.
- ▶ Depending on the system configuration this can allow higher than recommended flow temperatures if an under-floor circuit if fitted.

6.3.1 Integral keyless filling link

- ▶ When opening the isolation valves take care not to induce any water hammer.
- ▶ Open the district heating supply isolation valve.
- ▶ Open the district heating return isolation valve and release any air using the manual air vent.
- ▶ Slowly open the isolation valve on the mains cold water inlet.
- ▶ Slowly open the isolation valve on the domestic hot water outlet.
- ▶ Venting district circuit (domestic hot water side): Provide a domestic hot water demand in order for the domestic hot water control valve to open, then any air can be vented out using the manual air vents at the top of the plate heat exchanger.
- ▶ Open the central heating flow isolation valve
- ▶ Open the central heating return isolation valve
- ▶ Pull the lever [1] down to start the filling the central heating system.
- ▶ Monitor the pressure gauge needle [2].
- ▶ When the needle reaches between 1 to 1.5 bar on the gauge [3], release the lever [1] to stop the filling process.
- ▶ Venting district circuit (central heating side): Provide a central heating demand in order for the central heating control valve to open, then any air can be vented out using the manual air vents at the top of the plate heat exchanger.

District heating supply:
The maximum district heating system pressure is 10 bar.

- ▶ Ensure that the system pressure in the district heating circuit does not drop below 1 bar as this may effect system performance.

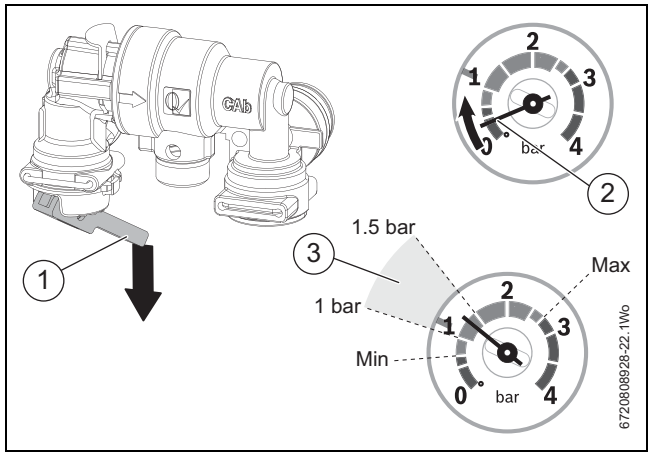


Fig. 37 Filling link operation

- ▶ Check the pressure and top up the central heating system if required.
- ▶ Repeat this process until there is no more air in the system and the operating pressure remains stable at between 1 to 1.5 bar.
- ▶ When venting is complete:
  - Ensure that all manual air vents are fully closed.
  - Check for any leaks.

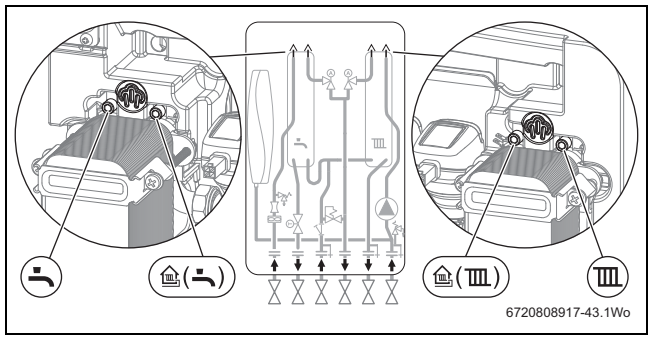


Fig. 38

6.3.2 External filling link (not supplied with appliance)

External filling loop
- ▶ It is recommended that the external filling loop is fitted to the District primary side of the system, as this contains treated water.
- ▶ If the external filling loop is connected to the cold main, then it is recommended that the heating system is flushed and treated to BS 7593.

- ▶ Connect the flexible hose between the filling loop isolation valves.
- ▶ When opening the isolation valves take care not to induce any water hammer.
- ▶ Open the district heating supply isolation valve.
- ▶ Open the district heating return isolation valve and release any air using the manual air vent.
- ▶ Slowly open the isolation valve on the mains cold water inlet.
- ▶ Slowly open the isolation valve on the domestic hot water outlet.
- ▶ Venting district circuit (domestic hot water side): Provide a domestic hot water demand in order for the domestic hot water control valve to open, then any air can be vented out using the manual air vents at the top of the plate heat exchanger.
- ▶ Open the central heating flow isolation valve
- ▶ Open the central heating return isolation valve
- ▶ Open the filling loop isolation valves to start filling the central heating system.
- ▶ Monitor the pressure gauge needle.
- ▶ When the needle reaches between 1 to 1.5 bar on the gauge, close the filling loop isolation valves to stop the filling process.
- ▶ Venting district circuit (central heating side): Provide a central heating demand in order for the central heating control valve to open, then any air can be vented out using the manual air vents at the top of the plate heat exchanger.

District heating supply:

The maximum district heating system pressure is 10 bar.
- ▶ Ensure that the system pressure in the district heating circuit does not drop below 1 bar as this may effect system performance.

- ▶ Check the pressure and top up the central heating system if required.
- ▶ Repeat this process until there is no more air in the system and the operating pressure remains stable at between 1 to 1.5 bar.
- ▶ When venting is complete:
  - – Ensure that all manual air vents are fully closed.
  - – Check for any leaks.

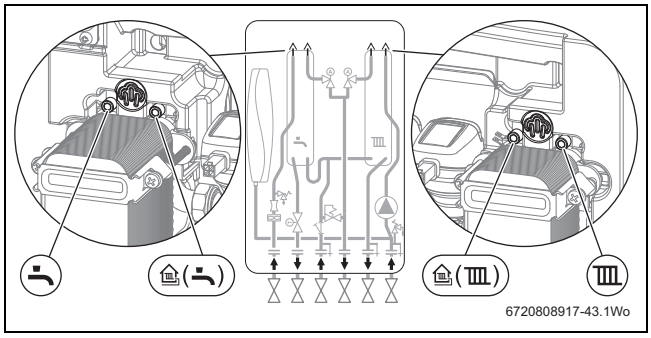


Fig. 39

6.4 Control unit

The control units LED indicators can be seen from the top of the case through two viewing holes.

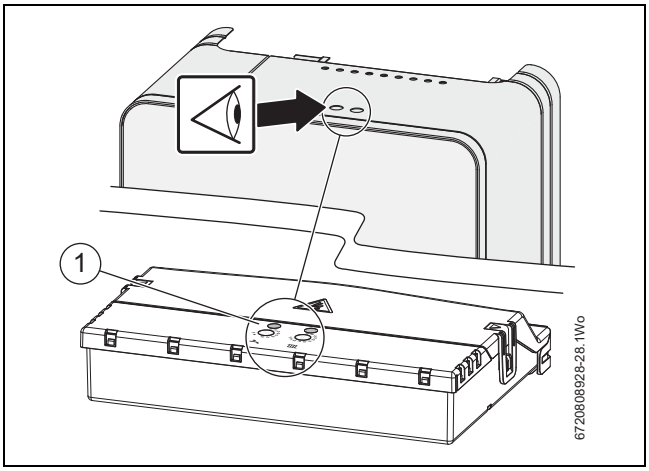


Fig. 40 Control unit LED indicator viewing points.

6.4.1 Control unit LED Indicators

When power is switched ON to the control unit and the rotary switches are at position 00, both LEDs are yellow. At all other rotary positions both LEDs are green.

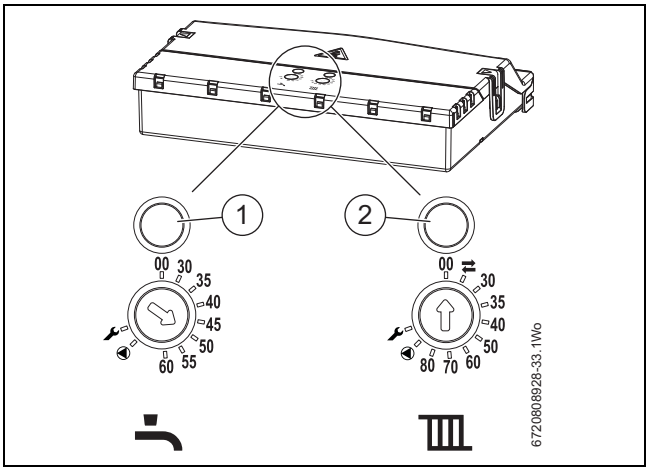


Fig. 41 Control Unit LED indicators

[1] Domestic hot water LED indicator
[2] Central heating LED indicator

Left LED (DHW)	Right LED (CH)	Description
Yellow flashing	Yellow flashing	HIU starting up
No	-	DHW rotary switch position 0 (DHW function is turned off)
-	No	CH rotary switch position 0 (CH function is turned off)
Green	-	DHW rotary switch position • 30, 35, 40, 45, 55 & 60 (DHW normal running at required set point)
-	Green	CH rotary switch position • ⇄, 30, 35, 40, 50, 60, 70 & 80 (CH normal running at required set point)
Green flashing	-	DHW rotary switch position • ◀ & 🔧 (DHW in pump service or calibration mode)
-	Green flashing	CH rotary switch position • ◀ & 🔧 (CH in pump service or calibration mode)
Red Flashing	-	DHW rotary switch position is invalid (by-pass, DHW and circulation pump functions are disabled)
-	Red Flashing	CH rotary switch position is invalid (CH function is disabled)

Table 9 Control unit operation indication

When an error occurs the LEDs indicate the particular error as shown in the fault finding section (→ 9.3).

The two rotary switches on the HIU module are divided into a CH and a DHW parameter control.

They combine the following functionality:

- Define the appliance central heating hydraulic.
- Define the appliance central heating and domestic hot water set-point temperatures.
- Calibrate control valve and allow service operation of the CH pump and DHW circulation pump.
  - When in calibration mode it will take approximately 5 seconds for the control valve calibration to complete.
- Service operation of the central heating circulating pump.
- Switch off the appliance.

Both rotary switches can be set separately in order to activate or deactivate CH or DHW functions.

The service functionality (🔧 and ◀) provides opening and closing of the control valves as well as running CH and circulation pumps to test all actuator functionality. The following tables shows the position set point values.

Control valve calibration

▶ The control valves do not require calibration at the commissioning stage. Calibration should only be necessary in the event of a control valve error indication (→Control valve fault indication, section 9.4).

The service function 🔧 for both domestic hot water and central heating combines two functions whilst the rotary switch is set to 🔧 position.

- Control valve calibration.
- After 10 seconds the control valve opens for 10 minutes for system setup and testing purposes.

The control valve will close after the 10 minutes if left in the 🔧 position or the rotary switched is returned to a temperature set point position.

6.4.2 Domestic hot water rotary switch

▶ Set the rotary switch to the set point for the approximate hot water outlet temperature required.

	Position	Set point °C	Function
	00	00	Hot water off
	30	30	Hot water on
	35	35	Hot water on
	40	40	Hot water on
	45	45	Hot water on
	50	50	Hot water on
	55	55	Hot water on
	60	60	Hot water on
		-	-
	◀	0	Domestic hot water circulation pump service
	🔧	0	Hot water valve calibration and test mode.

Table 10 Domestic hot water rotary switch positions

Maximum domestic hot water temperature.

▶ A domestic hot water safety shut-off valve is provided in order to interrupt the hot water flow to the tap in the event of excessive hot water temperatures due to a failure condition.

6.4.3 Central heating rotary switch

▶ Set the rotary switch to the set point for the approximate central heating flow temperature required for the system.

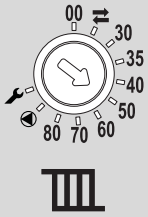
	Position	Set point °C	Function
	00	00	Central heating off
	⇄	90	Network connected • Direct units only
	30	30	Network isolated/injection
	35	35	Network isolated/injection
	40	40	Network isolated/injection
	50	50	Network isolated/injection
	66	60	Network isolated/injection
	70	70	Network isolated/injection
	80	80	Network isolated/injection
	◀	0	Central heating circulation pump service
	🔧	0	Central heating valve calibration and test mode.

Table 11 Central heating rotary switch positions

6.5 Control valve status indication

The control valves for Central Heating and Domestic Hot Water have three indicators on the head of the actuator to denote operational states, see figure 7, items [4] and [5] to locate the valves.

The case, insulation and control box will need to be removed to gain access to the control valve indicators.

There are three symbols on the head of the valve actuator, behind these symbols are coloured indicators that are used to indicate the position of the plunger or a possible error situation (error indication → 9.4). The table below gives operational details of the coloured indicators and their meaning:

LED power save mode

- ▶ During normal operation if the valve has not moved from its current position for approximately 15 seconds it will enter a power save mode and the active LEDs will turn off.

Indicators ON	Description
Orange, blue and green	• Valve in start up mode, will not respond to any input. • Valve re-calibration is running.
Green	Valve is completely open
Green and blue	Valve is between 60 and 99.9% open, but not fully open
Blue	Valve is between 40 and 60% open
Blue and orange	Valve is between 0.1 and 40% open, but is not completely closed
Orange	Valve is completely closed

Table 12 Control valve operation status

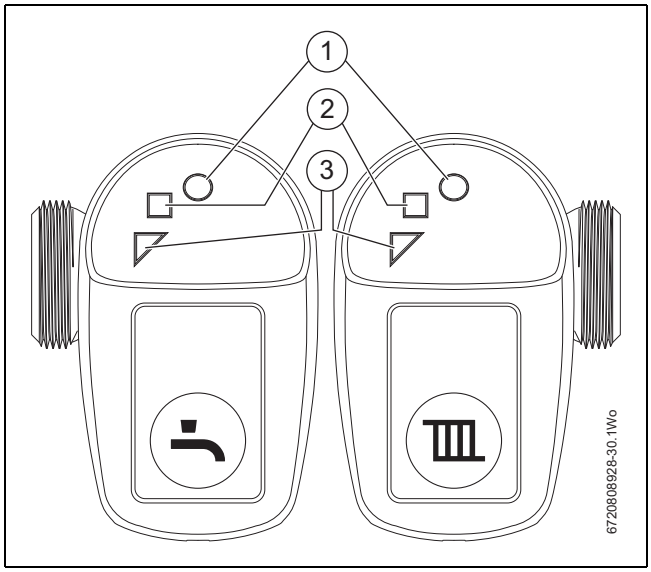


Fig. 42 Control valve status indicators

[1] Circle - Green
[2] Square - Blue
[3] Triangle - Orange

6.6 Central heating circulation pump

The circulating pump has five LED indicators [1], this shows details of operational status, current pump curve setting, adjusting pump curve setting and fault indication.

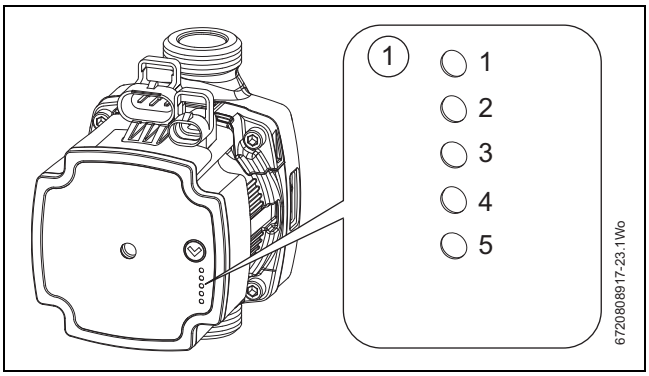


Fig. 43 Circulating pump status indication

[1] LED indicators

6.6.1 Pump key lock function

The key lock function prevents the adjustment of the pump settings.

- ▶ To toggle the key lock function press and hold the button for approximately 10 seconds.

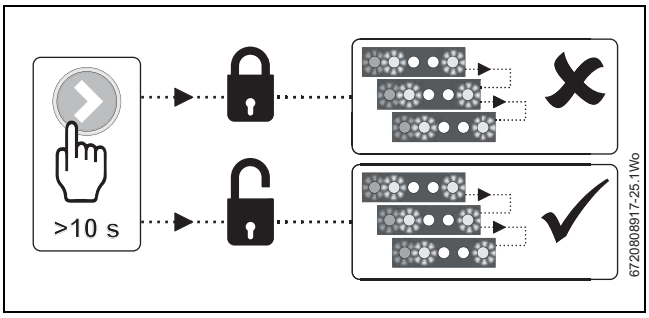


Fig. 44 Key lock

6.6.2 Pump operational status and view pump curve setting

The pump displays the current operating status [1] during normal running. It can also display the current pump curve setting [2].

- ▶ Press the button on the pump to view the current pump curve setting.
  - – The default pump curve setting is PP3, highest proportional pressure curve.

  After approximately 2 seconds the LED indicators will return to current operational status display mode.

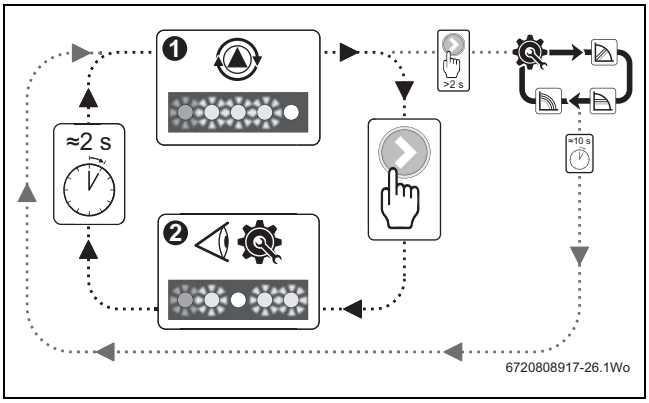


Fig. 45 Operation and view setting

[1] Normal operation indication (→ table 13 for details)
[2] View setting (current pump curve setting, → table 15 for details)

Operational status indication

When the circulation pump is running, LED1 is green. The four yellow LEDs indicate the current power consumption (P1) as shown in table 13. When the operation mode is active, all active LEDs are constantly on in order to differentiate this mode. If the circulation pump is stopped by an external signal, LED 1 flashes green.

Display	Indication	Performance in % of P1 maximum
One green LED (flashing)	Standby (only external controlled)	0
One green LED + one yellow LED	Low performance	0 - 25
One green LED + two yellow LEDs	Medium low performance	25 - 50
One green LED + three yellow LEDs	Medium high performance	50 - 75
One green LED + four yellow LEDs	High performance	75 - 100

Table 13 Operational status indication

6.6.3 Available hydraulic pressure

The residual hydraulic head available from the heat interface unit is shown in figure 46 for all proportional pressure settings.

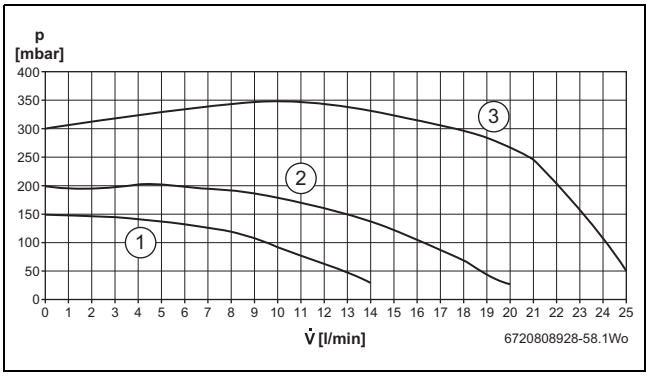


Fig. 46 Available hydraulic pressure

[1] PP1: lowest proportional pressure curve.
[2] PP2: intermediate proportional pressure curve.
[3] PP3: highest proportional pressure curve.

The default setting is PP3: highest proportional pressure curve.

6.6.4 Central heating circulation pump Characteristics

Modulating speed characteristics

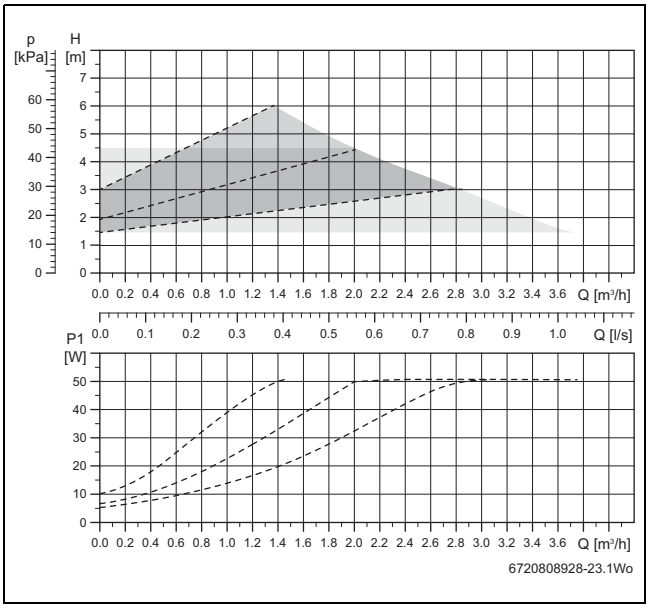


Fig. 47 Modulating speed characteristics

[P] Head (kPA)
[H] Head (m)
[Q] Flowrate, (m3/h or l/s)
[P1] Power (W)

- PP1: lowest proportional pressure curve.
- PP2: intermediate proportional pressure curve.
- PP3: highest proportional pressure curve. (default setting)

Setting	Maximum head (nominal)	Maximum P1(nominal)
Curve 1	4 m	25 W
Curve 2	5 m	33 W
Curve 3	6 m	39 W

Table 14 Modulating speed characteristics

The head (pressure) is reduced at falling heat demand and increased at rising heat demand.

6.6.5 Pump curve adjustment

It is recommended that only proportional pressure curves be used on this appliance. This ensures the most efficient operation and maintains performance of the appliance.

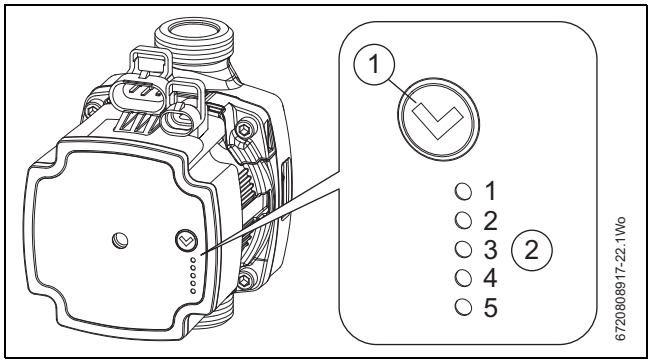


Fig. 48 Circulating pump curve indicators

[1] Selection button
[2] Indicator LEDs

	LED 1	LED 2	LED 3	LED 4	LED 5
PP1 (curve 1)	Green	Yellow	-	-	-
PP2 (curve 2)	Green	Yellow	-	Yellow	-
PP3 (curve 3)	Green	Yellow	-	Yellow	Yellow

Table 15 Proportional pressure curve indicators

- ▶ Press and hold the pump button approximately 2 seconds.
- ▶ Press the pump button to move to the next pump curve setting.
- ▶ Repeat pressing the pump button to cycle through the pump curves settings until reaching the required pump curve.

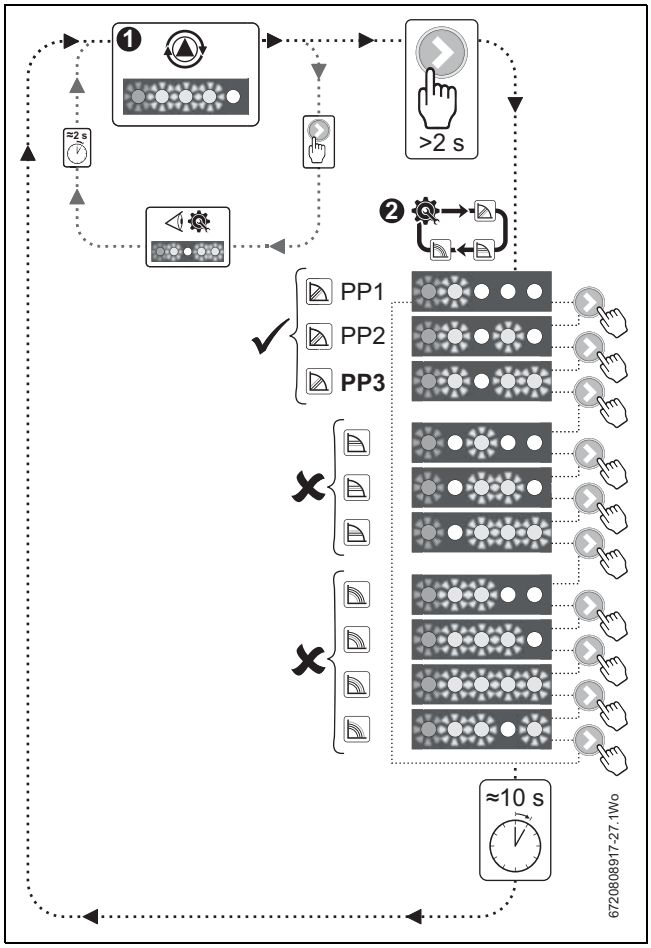


Fig. 49 Pump curve adjustment

6.7 Integral heat meter (if fitted)

The heat meter complies with the requirements of the European Directive MID 2004/22/EC modules B and D and of the standard EN 1434 class 2.

Technical data

integrator	
Temperature sensors	
Temperature sensor 2 wires	Pt1'000
Diameter	Ø 5.0; Ø 5.2, Ø 6.0 mm
Cables length	1.5 m
Admissible range	0...110 °C
Differential range	3...75 °C
Response limit	0.5 K
Temperature resolution (display)	0.1 K
Temperature resolution Δt	0.01 K
Measurement cycle for temperature	from 10 seconds
Measurement cycle for flow[1)]	Permanently
Environment class	
Environment class	C
Mechanics	M1
Electronics	E1
Battery protection class	III
Cable connection between flow sensor and integrator	0.6 m, fix
Protection index	IP 65
Permissible temperature	
Operation	5...55 °C
Storage and transport	-10...60 °C
Display	
Display	8-digits LCD
Display units	
Energy	kWh, MWh, MJ, GJ
Volume	m^3
Temperature	°C
Δ temperature	K
Power supply	
Lithium battery 3V	6+1 or 12+1 years
Powered by M-Bus line	1 device = 2 M-Bus charges (max 2 x 1.5mA)

Table 16

1) the oscillating measurement principle and the differential pressure piezo sensor ensures at any time that all pulses, ie, all volume is detected. In contrary to the ultsasonic measuring principle, no scanning with a signal through the water is necessary.

Integrator pulse output option with accessary only	
Pulse output	
Open drain (MOS Transistor) Vcc_{max}: 35 V_{DC}; ICC_{max}: 25mA	1 Hz, 500 ms
Pulse inputs with a dry contact	
Power supply internal	2.3 V_{DC}
$R_{pull\ UP\ internal}$	2 M Ω
Pulse factor	0...999.999 m^3/Imp or without unit

Table 17

The heat meter is designed on the basis of the proven fluid oscillation principle. Due to the use of a static flow sensor, the heat meter does not have any moving parts and thus no wear. The fluid oscillation principle guarantees a high stability and repeatability for a reliable and precise measurement of flow and thermal energy.

The heat meter consists of a static fluid oscillator flow sensor for flows from qp 0.6 - 2.5 m^3/h, in permanent connection with a removable integrator and a pair of temperature sensors covering an operation range from 5 °C - 90 °C.

Main features

The heat meter optimized for the measurement and calculation of energy consumption in district or local heating systems.

- Complies with the requirements of the European Directive MID 2004/22/EC modules B and D and of the standard EN 1434 class 2.
- Flow of qp 0.6 - 2.5 m^3/h.
- Corrosion resistant materials.
- No moving parts, thus no wear.
- Not sensitive to dirt.
- Stable.
- Direct pick-up of voltage pulses without reflectors.
- Long-term stability, accurate and reliable measurement.
- Easy to operate and read.
- Non-volatile EEPROM memory.
- 18 monthly energy values for heat energy, volume and for the set day values.
- Self-monitoring of conditions.

Functions

- Recording heat consumption by means of measuring the flow and temperature difference.
- Displaying consumption data:
  - 18 monthly energy and volume values.
  - Set day values.
  - Operating data.
  - Self-monitoring with error display.

Energy calculation

The flow sensor records the flow. Using a microprocessor, the integrator calculates the temperature difference and calculates the thermal energy, respectively the heating energy, consumed using the average flow and the heat coefficient.

Monthly values

At the end of each month, the monthly values are stored. A total of 18 monthly values of heat energy are volume are memorized in the integrator.

Powered remote M-Bus

The powered remote M-Bus communication interface is a serial interface which permits communication between different M-Bus devices via a central M-Bus station.

The M-Bus protocol is compliant with standard EN1434-3.

By default, the primary address will be configured with the address 0 and the secondary address will correspond to the serial number of the heat meter.

Technical data for the M-bus communication system:

M-Bus protocol compliant with standard EN 1434-3; free potential interfacing without polarity (the voltage measured on the last device must exceed 36VDC); transmission speed 300/2400 Baud; variable data structure.
Type of cable recommended: telephone cable JYStY N*2*0.8 mm^2.

Integrator display

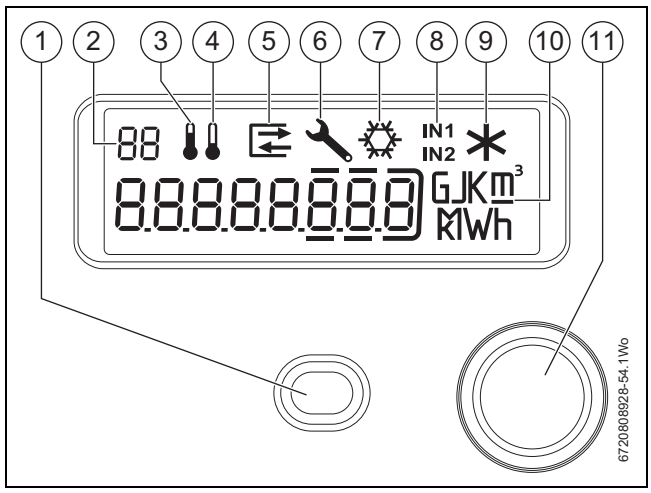


Fig. 50

[1] Optical sensor
[2] Monthly value index
[3] Flow temperature
[4] Return temperature
[5] Communication
[6] Service level
[7] Cooling use (not used)
[8] Additional pulse input 1 & 2 (not used)
[9] Impeller wheel in operation
[10] Units
[11] Navigation button

Menu structure

The integrator allows the energy [1], set day [2], volume [3], service [4] and error codes [5] to be displayed. The default display screen is the Energy display.

To access the different top level displays:

▶ Press the navigation button [11], figure 50 to cycle through the following categories:

- **Energy** [1], figure 51.
  - Current energy usage, initial category screen display, also default screen.
  - The last 18 months of recorded energy values.
- **Set day** [2], figure 51.
  - Current day, initial category screen display.
  - The Energy for that day.
  - The Volume for that day.
- **Volume** [3], figure 51.
  - Current volume usage, initial category screen display.
  - The last 18 months of recorded volume values.
- **Service** [4], figure 51.
  - Flow meter mounting position, initial category screen display.
  - Identification number.
  - High temperature.
  - Low temperature.
  - Delta temperature.
  - Actual flow.
  - Actual power.
  - Time of device.
  - Date of device.
  - Running hours.
  - Software version.
  - LCD test.
- **Error** [5], figure 51.
  - Error code.

- ▶ To enter the category required press and hold the navigation button for approximately 2 seconds.
- ▶ To cycle through the displayed data pressing the navigation button repeatedly.
  Once all the data has been displayed for the category the display will move to the error display before returning to the default display screen of Energy [1], figure 51.

After 3 minutes, the display automatically returns to the default Energy screen.

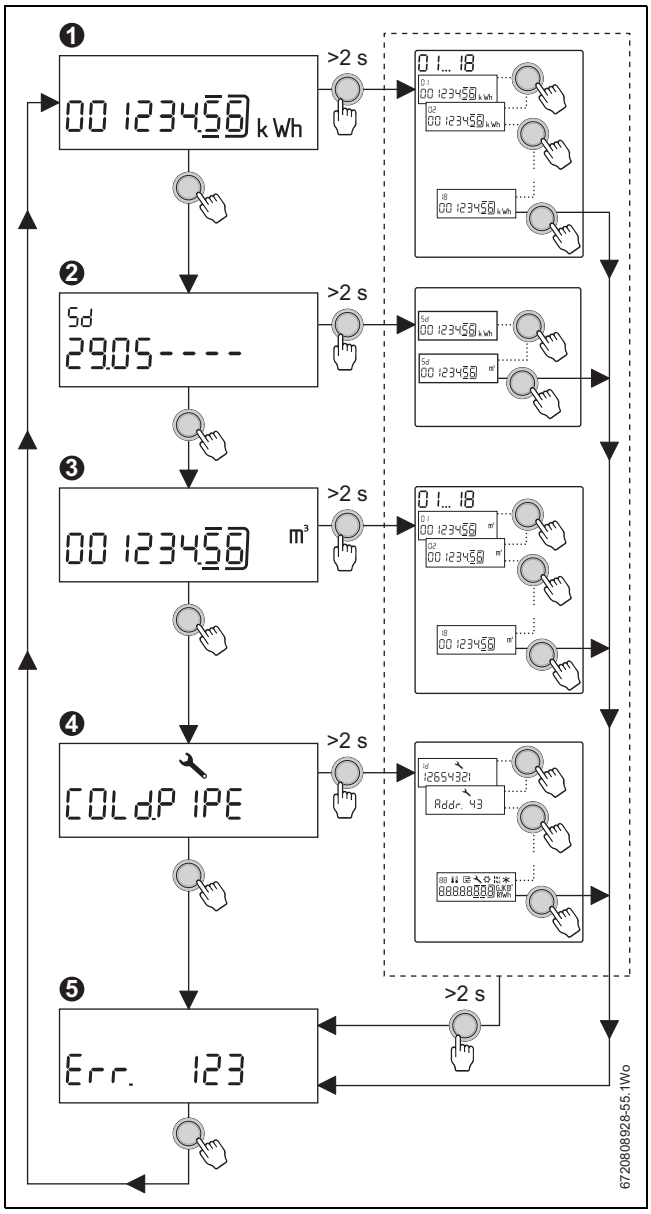


Fig. 51 Menu structure

Commissioning

- ▶ Ensure that the measurements indicated on the meter are coherent using the orange button which is located on the meter.
  - – The communication arrows allow display of the controls (inputs) and responses of the instrument (outputs).

All the display parameters will be used to check and adjust the installation. In particular, ensure that the maximum flow rate of the installation does not exceed the maximum flow rate for the meter. To complete the functional analysis, the commissioning protocol can be saved using the Prog7X9 software via the optical interface.

Contact details for obtaining Prog7X9 software, DMS Metering Solutions.

- By post
  - – DMS Flow Measurement & Controls Limited,
    X-Cel House, Chrysalis Way, Langley Bridge,
    Eastwood,
    Nottingham,
    Nottinghamshire,
    NG16 3RY.
- On-line
  - – sales@dmsltd.com
- By phone
  - – 01773 534555

Heat meter external signal connections

Cable routing

- ▶ Route cables through the back of the unit.
- ▶ Run power cables separately from signal cables. Interference from power cables can induce spurious faults on signal cables, ensure that there is at least 100mm separation from each other.
- ▶ Ensure the cables are of sufficient length to allow the control box to be hung in the service position.

Heat meter M-Bus connection

It is possible if the cable from the heat meter is of sufficient length to connect directly to M-Bus compatible external equipment.

If however if it is required to extend or use a connection point within the HIU for M-Bus compatible external equipment, then there is provision in the control box.

Refer to figure 52.

- ▶ Connect the heat meter M-Bus cable and cable used to connect to the M-Bus compatible external equipment into the connector block [1] in the control box.

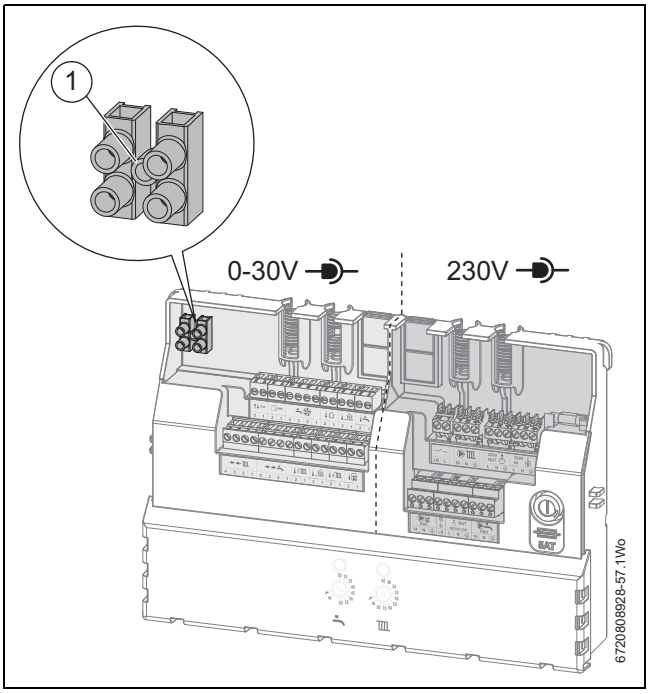


Fig. 52 M-Bus signal cable connection

[0-30V] Low voltage (signal cables) connections side
[230V] Mains voltage (power cables) connections side

Heat meter pulse output connection (only available on accessary)

Pulse meter accessory - the pulse outputs are made with SELV circuits (Safety Extra Low Voltage) and must only be connected with other SELV circuits. The pulse meter has two pulse outputs.

- Output S1
  - Heat energy
- Output S2
  - Volume

Whenever the smallest unit of heat or volume is incremented on the meter display, 1 pulse will be transmitted on the corresponding output cable S1/S2.

Electrical characteristics of the pulse outputs: open collector 1Hz 500ms.

The supplied cable should not be shortened. Pulse outputs can be read by pre-payment systems or other building level energy monitoring systems. Connect the pulse output cable directly to the monitoring system terminals, following any instructions supplied by the energy monitoring system manufacturer.

6.8 Water quality

6.8.1 Typical for District heating water

Description	Unit	Value
pH value	pH	7-10
Electrolytic conductivity	µS/cm	10
Hardness	°dH	0.5
Appearance	-	Clear and sediment free
Alkalinity	mgHCO_3/kg	60
Chloride concentration	mgCl/kg	50
Oxygen concentration	mgO_2	0.02
Iron concentration	mgFe/kg	0.1

Table 18

Typical additives

- BASF Glythermin NF (20-62%)
- Benckiser Randopophos HS Universal (0.5%)
- Copol (1%)
- Fernox F1
- Fernox F1 express
- Fernox Alphi-11
- Hoechst Antifrogen N (25-40%)
- Hoechst Antifrogen N+L (40%)
- Nalco Nalco (1-2%)
- Nalco Varidos 1+1 (1-2%)
- Nalco Varidos FSK (22-55%)
- Sentinel X100 (1-2%)
- Sentinel X200
- Sentinel X400
- Tyfocop Tyfocor L (25-80%)
- MC1+ Protector
- MC3+ Cleaner
- MC2 Silencer
- MC ZERO (25-40%)

6.8.2 Domestic hot water for copper brazed plate heat exchangers

Water containing	Concentration (mg/l or ppm)	AISI 316	Copper
Alkalinity (HCO_3)	<70	+	o
	70-300	+	+
	>300	+	o/+
Sulfate (SO_4^2)	<70	+	+
	70-300	+	o/-
	>300	+	-
HCO_3/SO_4^2	>1	+	+
	<1	+	o/-
Electrolytic conductivity (µS/cm)	<10	+	o
	10-500	+	+
	>500	+	o
pH	<6.0	o	o
	6.0-7.5	+	o
	7.5-9.0	+	+
	>9	+	o
Ammonia (NH_3)	<2	+	+
	2-20	+	o
	>20	+	o
Chlorides (Cl)	<300	+	+
	>300	-	o/+
Free Chlorides (Cl_2)	<1	+	+
	1-5	-	o
	>5	-	o/-
Hydrogen sulfide (H_2S)	<0.05	+	+
	>0.05	+	o/-
Free (aggressive) carbon dioxide (CO_2)	<5	+	+
	5-20	+	o
	>20	+	-
Total hardness (°dH)	<4	+	-
	4-20	+	+
	20-30	+	o
	>30	+	-
Nitrate (NO_3)	<100	+	+
	>100	+	o
Iron (Fe)	<0.2	+	+
	>0.2	+	o
Aluminium (Al)	<0.2	+	+
	>0.2	+	o
Manganese (Mn)	<0.1	+	+
	>0.1	+	o

Table 19

[+] Good resistance under normal conditions
[o] Corrosion problem possible
[-] Use is not recommended

6.9 Domestic hot water performance chart

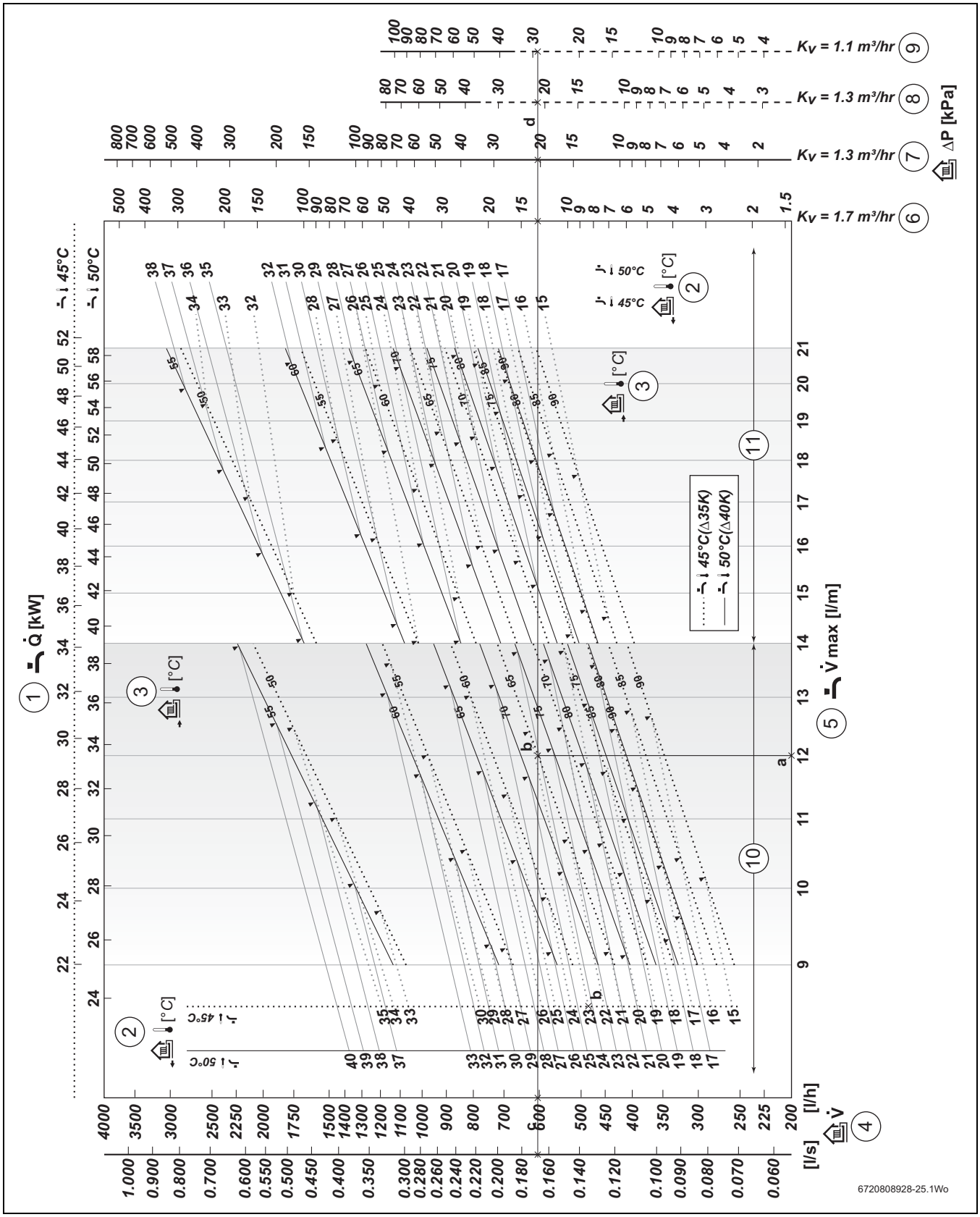


Fig. 53 Domestic hot water performance

Key to Domestic hot water performance chart, Figure 53:

[1] Domestic hot water power output [kW].
[2] Supply return temperature.
[3] Supply flow temperature.
[4] Supply volumetric flow rate [l/s] and [l/h].
[5] Domestic hot water maximum volumetric flow rate [l/m].
[6] Supply differential pressure [kPa] (Standard unit).
[7] Supply differential pressure [kPa] (Standard unit and heat meter).
[8] Supply differential pressure [kPa] (Standard unit and Differential pressure control valve).
[9] Supply differential pressure [kPa] (Standard unit, Differential pressure control valve and heat meter).
[10] Domestic hot water standard performance range.
[11] Domestic hot water high performance range

Domestic hot water example

The domestic hot water performance chart, (figure 53, page 38) shows an example for calculating the domestic hot water performance.

- [a] $\dot{V}_{max}$ [l/m] Domestic hot water flow rate = 12 l/m
- [b] Supply temperature
  - 45 °C (Δ35K) flow = 65 °C
  - 45 °C (Δ35K) return = 23 °C
- [c] $\dot{V}$ [l/s]/[l/h] Supply volumetric flow rate = 0.168 l/s / 604.8 l/h
- [d] ΔP [kPa] Supply differential pressure
  - [Standard unit] = 13.13 kPa
  - [Standard unit with heat meter] = 21.2 kPa
  - [Standard unit with Differential pressure control valve] = 22.35 kPa
  - [Standard unit with Differential pressure control valve and heat meter] = 29.4 kPa

6.10 Central heating performance charts

6.10.1 15kW & 7.5kW

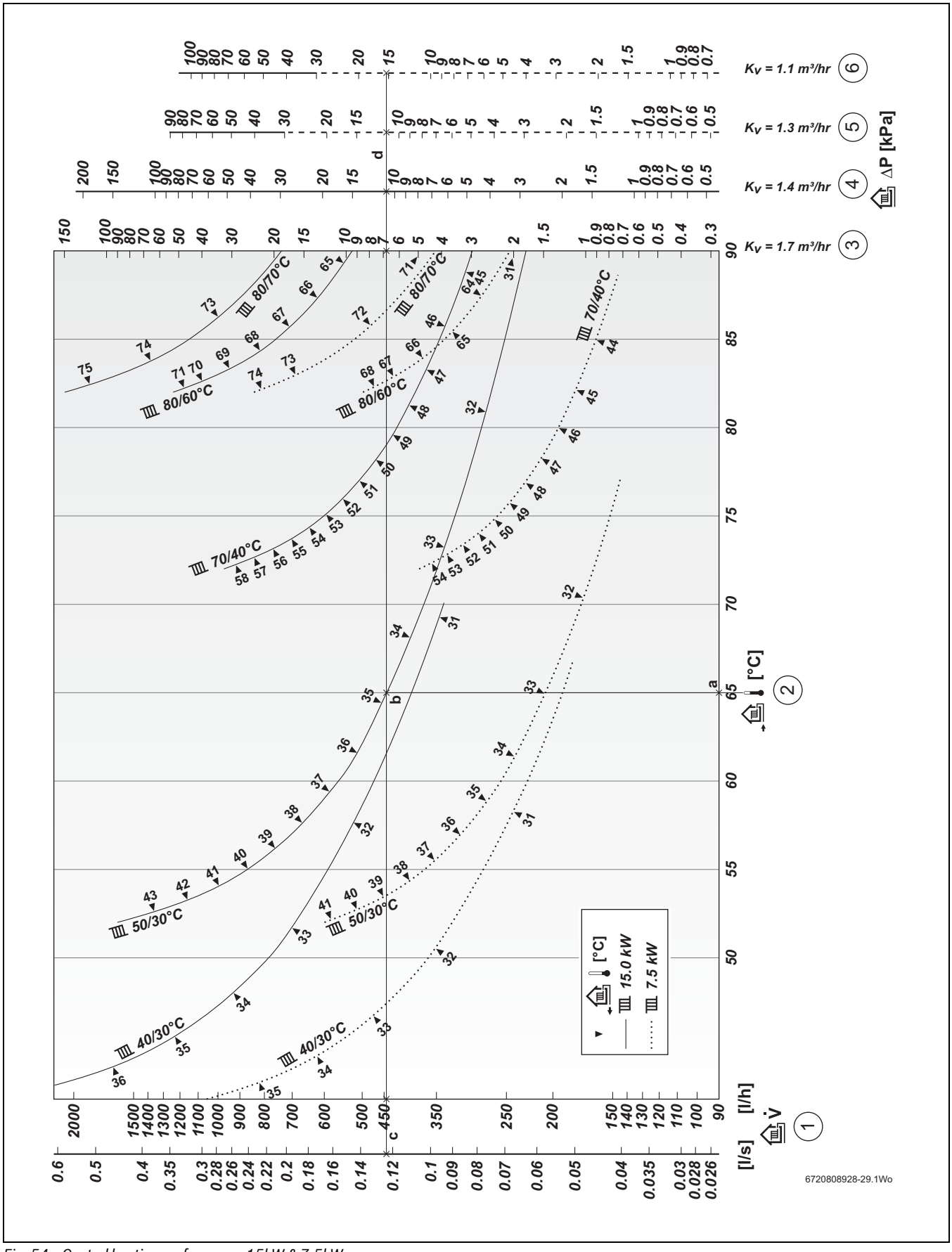


Fig. 54 Central heating performance 15kW & 7.5kW

Key to Central heating performance chart, Figure 54:

[1] Supply volumetric flow rate [l/s] and [l/h].
[2] Supply flow temperature [°C].
[3] Supply differential pressure [kPa] (Standard unit).
[4] Supply differential pressure [kPa] (Standard unit and heat meter).
[5] Supply differential pressure [kPa] (Standard unit and Differential pressure control valve).
[6] Supply differential pressure [kPa] (Standard unit, Differential pressure control valve and heat meter).

Central heating example

The central heating performance chart, (figure 54, page 40) shows an example for calculating the central heating performance.

- [a] [°C] Supply temperature = 65 °C
- [b] 50/30 °C (15.0 kW) Return temperature = 34.8 °C
- [c] $\dot{V}$ [l/s]/[l/h] Supply volumetric flow rate = 0.123l/s / 442.8l/h
- [d] ΔP [kPa] Supply differential pressure
  - [Standard unit] = 6.8kPa
  - [Standard unit with heat metre] = 10.9kPa
  - [Standard unit with Differential pressure control valve] = 11.2kPa
  - [Standard unit with Differential pressure control valve and heat meter] = 15.5kPa

6.10.2 5kW & 3.5kW

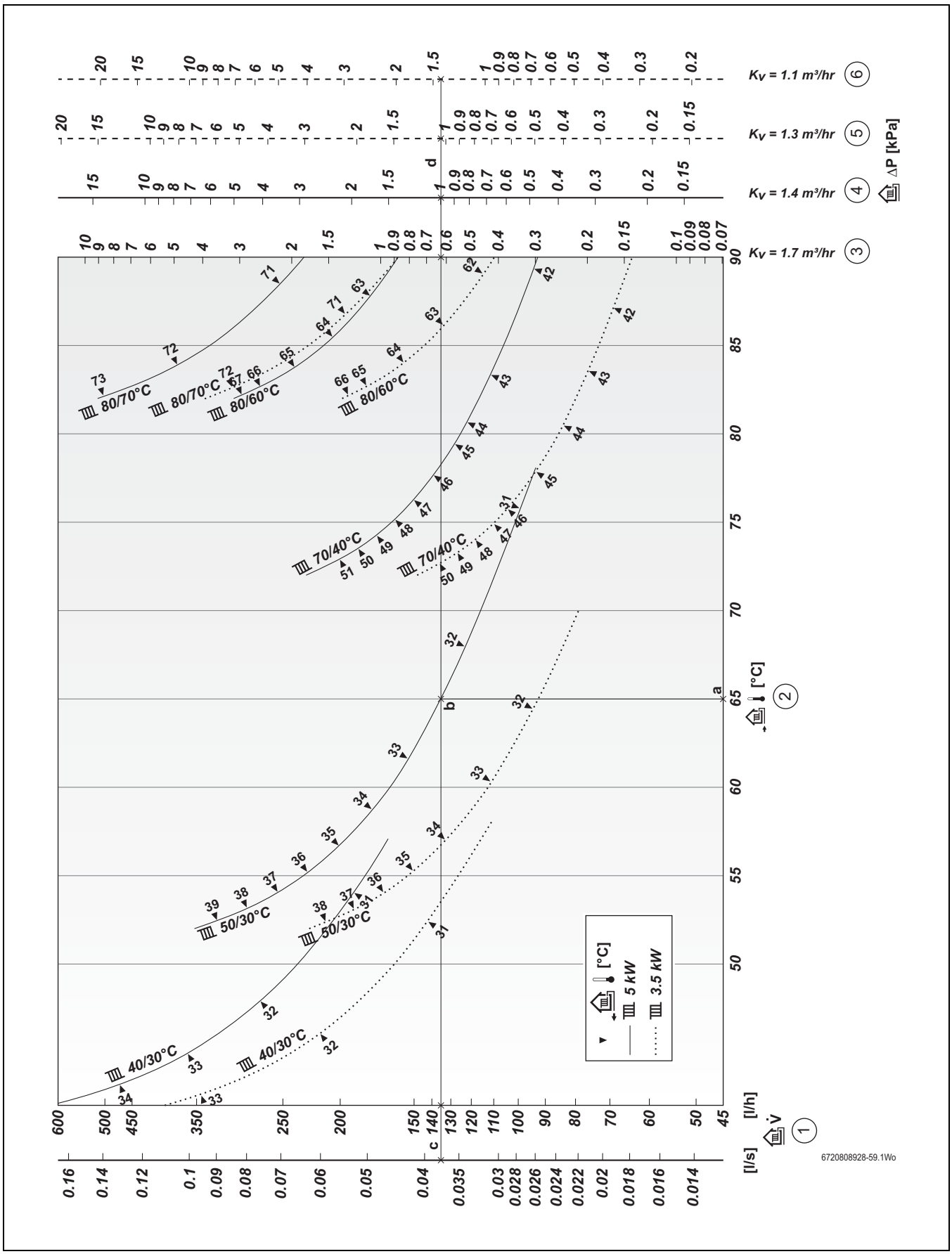


Fig. 55 Central heating performance 5kW & 3.5kW

Key to Central heating performance chart, Figure 55:

[1] Supply volumetric flow rate [l/s] and [l/h].
[2] Supply flow temperature [°C].
[3] Supply differential pressure [kPa] (Standard unit).
[4] Supply differential pressure [kPa] (Standard unit and heat meter).
[5] Supply differential pressure [kPa] (Standard unit and Differential pressure control valve).
[6] Supply differential pressure [kPa] (Standard unit, Differential pressure control valve and heat meter).

Central heating example

The central heating performance chart, (figure 55, page 42) shows an example for calculating the central heating performance.

- [a] [°C] Supply temperature = 65 °C
- [b] 50/30 °C (5 kW) Return temperature = 32.6 °C
- [c] $\dot{V}$ [l/s]/[l/h] Supply volumetric flow rate = 0.037l/s / 133.2l/h
- [d] ΔP [kPa] Supply differential pressure
  - [Standard unit] = 0.63kPa
  - [Standard unit with heat metre] = 1kPa
  - [Standard unit with Differential pressure control valve] = 1.05kPa
  - [Standard unit with Differential pressure control valve and heat meter] = 1.42kPa

6.11 Testing

Functional checking, heat outputs and balancing flow for a system containing multiple Heat Interface Units:

▶ For a known district supply temperature, determine the nominal district flow rate and supply differential pressure required to achieve the requested domestic hot water output from either figure 53 or 54 as appropriate.

The internal DPCV (if fitted) will limit the maximum district flow rate through the HIU to 0.38 l/s for 58.6kW and 0.355 l/s for 39.1kW models.

▶ If fitted, ensure that a Flow regulating valve (with pressure test points at inlet and outlet) is fitted in the district return pipe work at each Heat Interface Unit, → section 5.1.7.
  – The function of the Flow regulating valve is to ensure that the correct nominal flow rate is achieved at each Heat Interface Unit.
  – For units without a heat meter.
    By measuring the differential pressure across the regulating valve, this can be converted into the corresponding district flow rate using charts supplied by the manufacturer.
▶ With each Heat Interface Unit operating in a maximum domestic hot water demand, adjust each flow regulating valve to achieve the required nominal district flow rate.
  – Check that the LED indication lights on top of the domestic hot water control valve are indicating correctly. See table 12.
  – Check that the LED indicator lights at the top of the HIU control unit are indicating correctly see table 9.
  – If the nominal district flow rate cannot be achieved, check the differential pressure across the district flow and return adjacent to the Heat Interface Unit. Ensure that the actual differential pressure measured corresponds to the nominal differential pressure from figure 53 or 54.
▶ Check that the required domestic hot water flow rate and temperature rise is achieved for each Heat Interface unit. By using the following equation, the domestic hot water heat output, Qdhw in kW can be determined:
  – Qdhw (kW) = 0.07 x dhw flow rate (l/min) x temperature rise (K)
▶ Set the room controller to call for heat and with each Heat Interface Unit operating in a maximum central heating demand, check that the nominal district flow rate is achieved.
  – Check that the LED indication lights on top of the central heating control valve are indicating correctly. See table 12.
  – Check that the LED indicator lights at the top of the HIU control unit are indicating correctly see table 9.
  – Generally, the nominal district flow rate for domestic hot water is higher than that required for central heating, so it will not be necessary to re-adjust the flow regulating valves.
▶ Whilst each Heat interface Unit is operating in a central heating demand, measure the temperature differential across the flow/return connections on the central heating side at the Heat Interface Unit. Also measure the central heating water flow rate. By using the following equation, the central heating heat output, Qch in kW can be determined:
  – Qch (kW) = 0.07x ch flow rate (l/min) x Delta T (k)

If it is not possible to measure the CH flow rate, the heat input in CH mode can be calculated by measuring the temperature difference across the district flow/return connections and the district flow rate.

▶ The following equation can be used to determine the heat input:
  – Qch,in (kW) = 0.07x district flow rate (l/min) x Delta T (k)

  The efficiency of the CH plate heat exchanger is >98%.
▶ Alternatively, if a heat meter is fitted, the heat input (kwh) can be recorded for both DHW and CH.

6.12 Commissioning checklist

Customer name:	**Telephone number:**
Address:	

Installed by (print name):	**Installation date:**
Company name:	**Telephone number:**
Company address:	

Commissioned by (print name):	**Registered Operative ID number:**
Company name:	**Telephone number:**
Company address:	

Building Regulations Notification Number (if applicable):	
1	**Appliance make and model:**
2	**Appliance serial number:**

	Commissioning	Unit	Values	Comment
3	**The central heating has been flushed and cleaned in accordance to the standards and guidelines**		☐	
4	**System Hydraulic:**			
	Network isolated (indirect) with internal pump:			
	Single zone radiator circuit (unmixed)		☐	
	Single zone under-floor circuit (unmixed) + over-temperature protection		☐	
	Network isolated (indirect) without internal pump			
	Single zone radiator circuit (unmixed) + single zone under-floor circuit (mixed) + over-temperature protection		☐	
5	Fill the central heating system and check for leaks		☐	
6	Pressurise the central heating and record the value	bar		
7	Check for leaks during operation		☐	
8	**Measure and record values: District system**	bar		
	Differential Pressure Control Valve arrangements			
	Internal HIU DPCV		☐	
	External DPCV installer supplied		☐	
	Model type:	Setting		
	No DPCV, supply differential pressure less than 80kPa (800mbar)		☐	
	Static district pressure (max system pressure)	bar (g)		
	Working district pressure	bar		
	Primary pressure system breaks		Yes ☐	
	Flushing by-pass fitted and closed		Yes ☐	
	Dwelling isolation valves fitted		Yes ☐ Location:	
	Strainers has been checked and cleaned		Yes ☐	

Table 20

9	**Measure and record values: Central heating**				
	Central heating flow temperature (at Heat Interface unit)	°C			
	Central heating return temperature (at Heat Interface unit)	°C			
	Central heating flow rate	l/min			
	Central heating output	kW			
	Supply flow temperature	°C			
	Supply return temperature [1]	°C			
	Supply volumetric flow rate	l/s			
		l/h			
	Supply differential pressure	kPa			
10	**Time and temperature control to central heating:** • Room thermostat and programmer/timer (for one central heating circuit only) • Programmable room thermostat (for one central heating circuit only)		☐ ☐		
	Thermostatic radiator valves		Yes ☐	No ☐	
	Automatic by-pass valve fitted to system		Yes ☐	No ☐	
11	**Measure and record values: Domestic hot water**				
	Is hot water available at all outlets		Yes ☐	No ☐	
	Domestic cold water inlet temperature	°C			
	Domestic hot water outlet temperature	°C			
	Domestic hot water flow rate	l/min			
	Domestic hot water output	kW			
	Supply flow temperature	°C			
	Supply return temperature	°C			
	Supply volumetric flow rate	l/s			
		l/h			
	Supply differential pressure	kPa			
12	**Heat meter fitted**		Yes ☐	No ☐	
13	**Functional tests refer to section 6.11**		☐		
14	**Refit casing panel**		☐		
15	**Inform homeowner and hand over documentation**		☐		
16	**Correct installation by approved installer**		Signature		
17	**Homeowner (confirm handover from installer)**		Signature		

Table 20

1) Refer to requirements within Building regulation Part L1 for communal heating.

6.13 Fitting the cover

- ▶ When all the commissioning is completed fit the cover [2] by locating the top of the cover over the lip [1] at the top of the back plate.
- ▶ Lower down into position and check the alignment of:
  - – The case does not to catch the PRV outlet pipe connection nut, which should be inside the case.
  - – The heat meter display in the window (if fitted).
- ▶ Secure the cover [2] with the two screws [3] to the mounting frame.

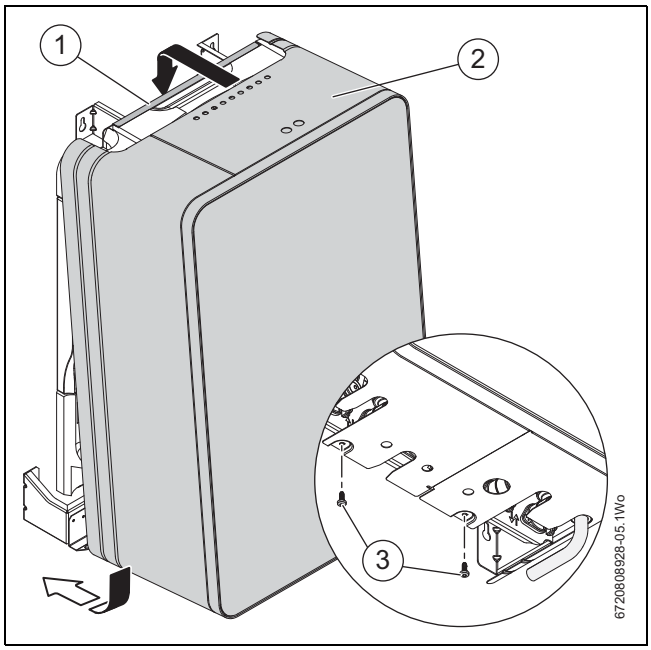


Fig. 56 Fitting the cover

6.14 Hand over

- ▶ Complete the Commissioning Checklist section 6.12, page 44.
- ▶ Set up the appliance controls and show the customer how to operate all the control unit/s for central heating operation.
- ▶ Show the customer where the serial number/appliance information is when they call in with a problem (Commissioning Checklist section 6.12, page 44).
- ▶ Show the customer how to safely isolate the appliance.
- ▶ Advise the customer where they can find information on the Worcester, Bosch Group website www.worcester-bosch.co.uk.
- ▶ Advise the customer that the varying external temperature will affect the output of the appliance, especially the domestic hot water.
- ▶ Ensure that the Installation and Maintenance manual, Commissioning Checklist and inspection record, is left with the appliance or homeowner.
- ▶ If known, please fill in local warden/site agent/contractor engineers details in the Fault or breakdown section of the User Instructions.
- ▶ if the appliance is unused and exposed to freezing conditions, shut off all the mains supplies and drain the system and appliance, label accordingly.

6.15 Appliance guarantee

This appliance has a guarantee against faulty materials or workmanship for a period from the date of installation subject to the following terms and conditions.

- The guarantee period for your product/component will vary depending on its type and the accreditation of your installer. To confirm the guarantee period applicable to your product, please visit our website www.worcester-bosch.co.uk.
- The guarantee must be registered within 30 days of installation.
- The householder may be asked to prove the date of installation, that the appliance was correctly commissioned. This should be documented as a part of the Commissioning Checklist.
- The product must be correctly installed and commissioned in accordance with the Installation instruction for your product and meet the requirements of the Benchmark initiative if applicable.
- The product must be maintained, inspected/serviced in accordance with the manufacturer's product instructions by a Bosch Thermotechnology Ltd or other competent Engineer. Proof of inspection/servicing may be required to validate a guarantee.
- During the period of this guarantee any components of the appliance which are proven to be faulty or defective in manufacture will be exchanged or repaired free of charge if repaired directly by Bosch Thermotechnology Ltd.
- Invoices for attendance and repair of this appliance by third parties will not be accepted for payment by Bosch Thermotechnology Ltd.
- That any product or part thereof returned for servicing under the guarantee must be accompanied by a claim stating the Model, Serial Number, Date of Installation.
- That Bosch Thermotechnology Ltd will not accept responsibility for damage caused by faulty installation, neglect, misuse or accidental damage or the nonobservance of the instructions contained in the Installation and Users Instructions leaflets.
- The appliance has been used only for the normal domestic purposes for which it was designed.
- That this guarantee applies only to equipment purchased and used in the United Kingdom of Great Britain and Northern Ireland, the Republic of Ireland, the Isle of Man or the Channel Islands.

For full terms and conditions, please visit:

www.worcester-bosch.co.uk/guarantee-terms-and-conditions

6.15.1 Guarantee registration

Your Greenstar appliance carries a guarantee against faulty material or manufacture subject to Terms and Conditions.

Guarantee Registration can be completed:

- Via the Worcester, Bosch Group guarantee app:
  - – By scanning the appliance label QR code, all the appliance information is populated in the app, so you just need to fill out the property and installer details.
- On-line
  - – You can register on our website: www.worcester-bosch.co.uk/guarantee
- By phone
  - – You can register by ringing 0330 123 2552
- By post
  - – Please send your completed form to: Worcester, Bosch Group, Cotswold Way, Warndon, Worcester, WR4 9SW.

To read full terms & Conditions please visit us on-line at www.worcester-bosch.co.uk/guarantee.
Your statutory rights are not affected by the manufacturer's guarantee.

7 Inspection and maintenance

Due to HIUs being an inherently low maintenance space heating system, the recommendation from BSRIA BG 62/2015 that a maintenance check every 3 years should be sufficient.

BSRIA inspection and maintenance procedure guidance recommends at least the following checks are carried out.

- No leaks associated with HIU or secondary distribution.
- Primary isolation valves are operable.
- Internal strainers are clear.
- Supply differential above required minimum.
- Thermal insulation is intact.
- Control valves respond to demand signals for heating and hot water.
- Supply temperatures to heating and hot water are as when the unit was commissioned.
- Check mains pressure storage water heater safety valve (where fitted).
- Heat meter registers demand (or replace and commission new heat meter if scheduled).
- Consumer is satisfied with heating and hot water performance.

7.1 Cleaning the district filter

7.1.1 Removing the cover

▶ Remove the two screws [2] lift the cover [1] off the mounting frame.

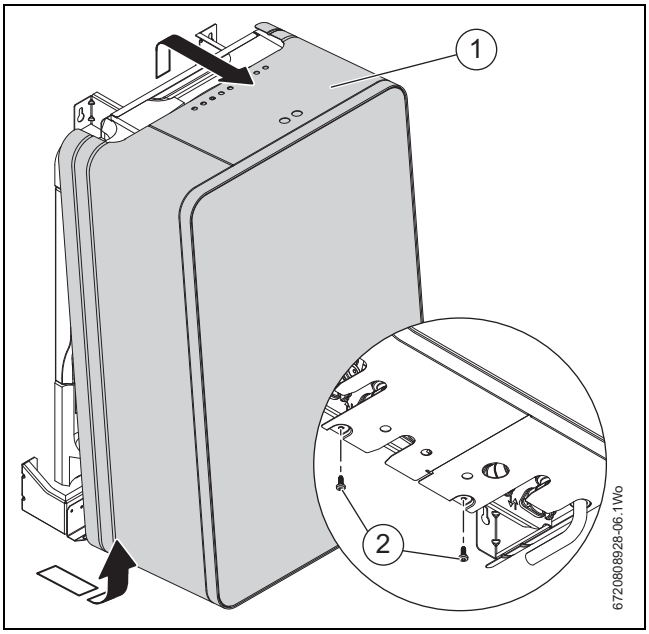


Fig. 57 Removing the cover

7.1.2 Draining the appliance

NOTICE: Risk of water damage to appliance or property!
Damage from disconnecting water pathways which may have retained some water.

▶ Take care after draining appliance to protect equipment/property from residual water content within components.

District and central heating system

▶ Isolate the appliance from the district and central heating system using the appliance isolation valves.

▶ Connect a suitable hose firmly to the required drain point and run the hose outside to a suitable point or container.

Draining the appliance.

▶ Open the air vents at the top of the desired circuit to aid draining the appliance.

▶ Ensure they are closed after draining has been completed.

▶ Turn the drain valve anti-clockwise to open the drain. Turn the valve firmly clockwise to close.

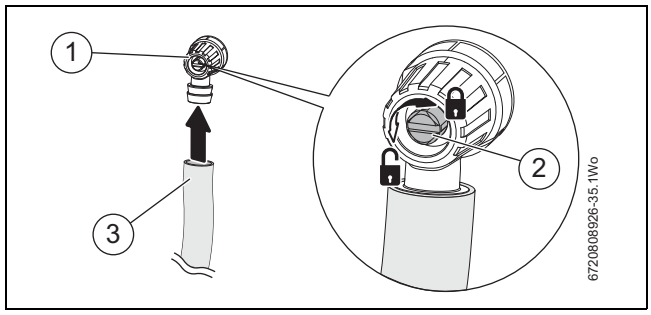


Fig. 58 Drain point connection

7.1.3 Filter removal

▶ Ensure the appliance is fully drained.

▶ Undo cap and drain point assembly [2].

▶ Ensure the bonded washer [3] is intact and undamaged, replace if necessary.

▶ Remove the filter [1] and clean.

▶ To refit follow the above actions in reverse.

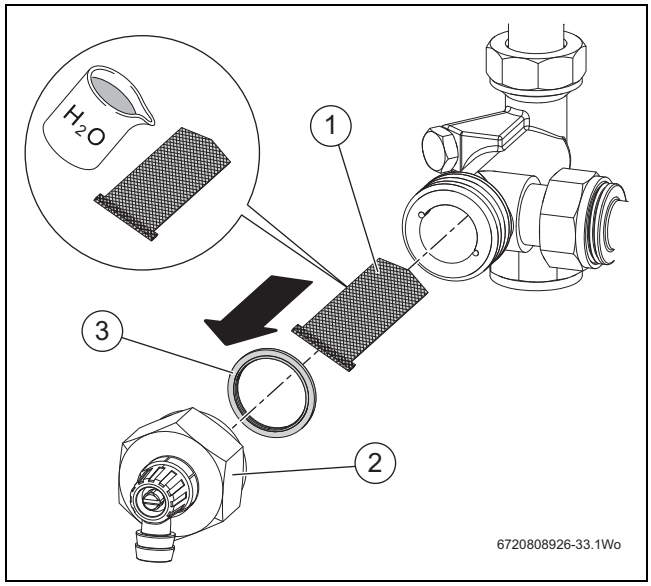


Fig. 59 Filter removal

7.2 Inspection record

Inspection 01	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

Inspection 02	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

Inspection 03	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

Inspection 04	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

Inspection 05	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

Inspection 06	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

Inspection 07	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

Inspection 08	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

Inspection 09	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

Inspection 10	Date:	
Engineer name:		
Company name:		
Telephone Number:		
Supply return temperature central heating mode	°C	
Secondary heating ΔT	°C	
Supply flow temperature domestic hot water mode	°C	
Supply return temperature domestic hot water mode	°C	
Supply flow rate at meter domestic hot water demand	l/m	
Domestic hot water outlet temperature	°C	
Domestic flow rate	l/m	
Comments:		
Signature		

8 Replacement of parts

CAUTION: Accessing internal components:
- Isolate the district heating and the electrical mains supply before starting any work on the appliance and observe all relevant safety precautions.

8.1 Draining the appliance

NOTICE: Risk of water damage to appliance or property!
Damage from disconnecting water pathways which may have retained some water.
- Take care after draining appliance to protect equipment/property from residual water content within components.

District and central heating system

Many of the tasks in this section require that the appliance be isolated and drained. This will be indicated in the manual if required.

- Isolate the appliance from the district and central heating system using the appliance isolation valves.
- Connect a suitable hose firmly to the require drain point and run the hose outside to a suitable point or container.
- Turn the drain valve anti-clockwise to open the drain. Turn the valve firmly clockwise to close.

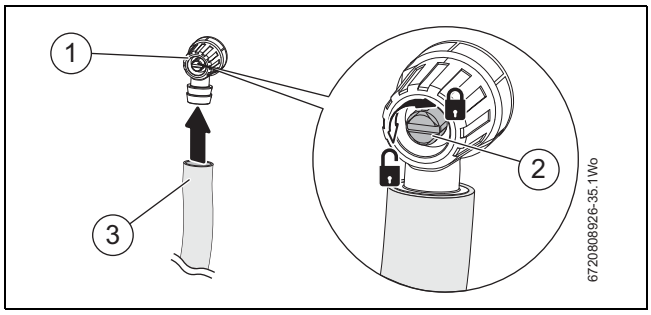


Fig. 60 Drain point connection

Domestic water system

- Isolate the cold mains inlet isolation valve.
- Drain the domestic water system.

8.2 Plate heat exchanger

Correct orientation
- When refitting the plate heat exchanger ensure it is correctly orientated, the label will have an arrow below the heat exchanger usage or . Also ensure the correct one is fitted, the label will match the symbol on the insulation behind the heat exchanger being replaced.

NOTICE: Damage to bracket and possible leaks
If one side is torqued down before the other, the brackets could be damaged and prevent correct sealing of hydraulic joints.
- Ensure the bracket securing screws are evenly tightened which will refit the heat exchanger square and level, creating a good hydraulic seal.

Refer to figure 61

- Ensure the appliance is fully drained.
- Undo the screws on the securing brackets [2].
- Remove the securing brackets [2] and plate heat exchanger [1].
  - Ensure that the seals [3] are removed from the upper [5] and lower [4] connection plates before replacing with new ones.
- To refit follow the above actions in reverse. Ensure any seals that have been disturbed are renewed.
  - When replacing ensure the correct plate heat exchanger is fitted.
  - Ensure the bracket securing screws are evenly tightened when refitting.

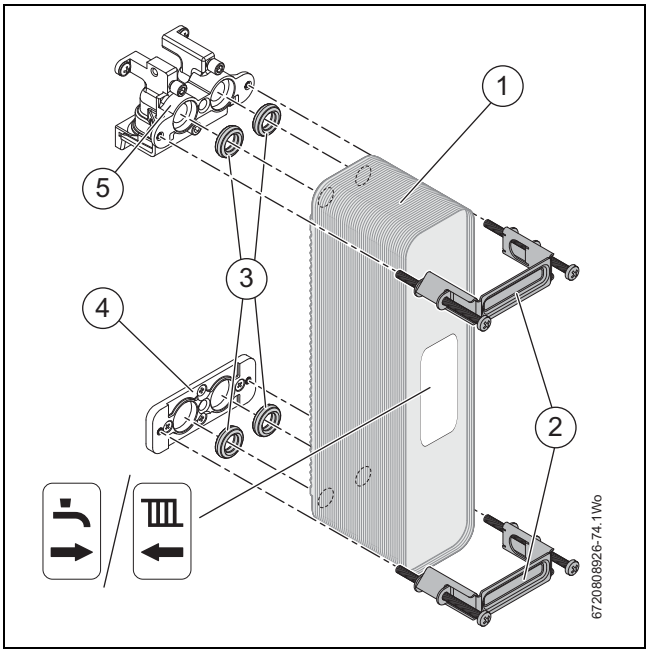


Fig. 61 Plate heat exchanger removal

8.3 Control valves

Refer to figure 62

- Ensure the appliance is fully drained.
- Disconnect the electrical connection/s [2] from the appropriate control valve/s [1] (heating or hot water).
- Undo the connection pipes [3].
- To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed.

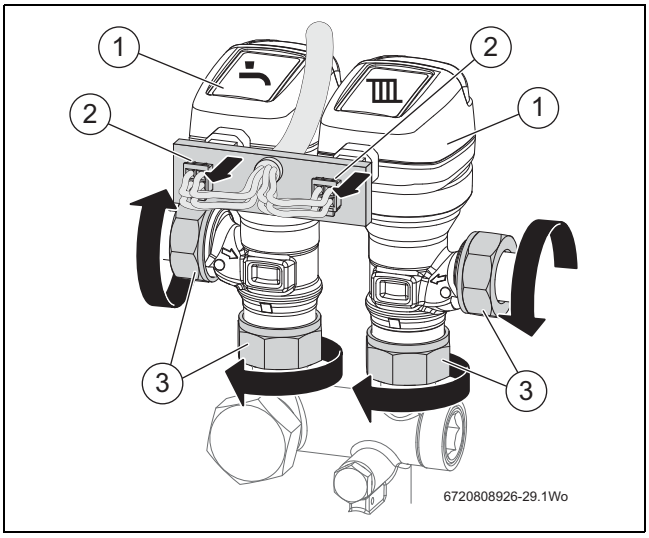


Fig. 62 Control valve/s removal

8.4 Differential pressure control valve

Refer to figure 63

- Ensure the appliance is fully drained.
- Undo the sensing tube connection [3].
- Undo the connection pipes [1] and remove the differential pressure control valve and pipe work [2].

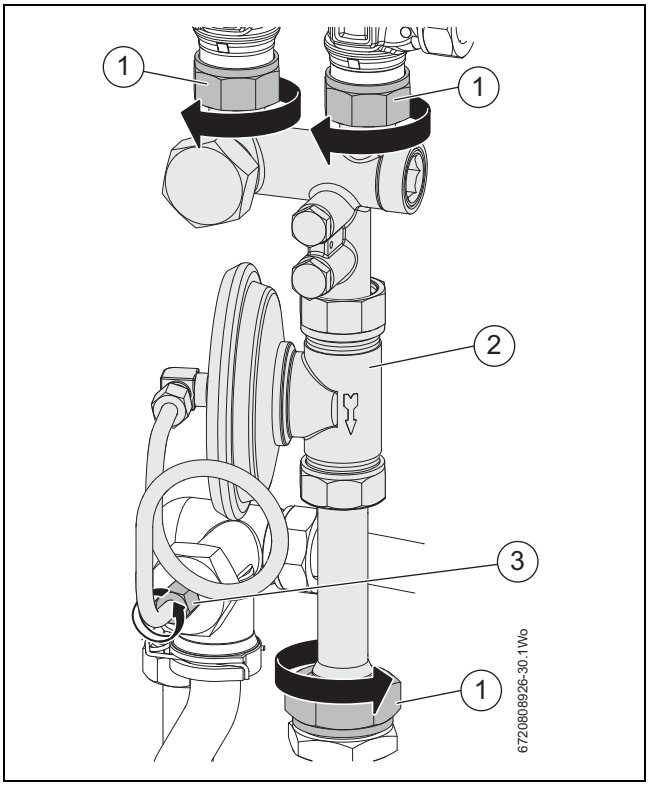


Fig. 63 Differential pressure control valve assembly removal

Refer to figure 64

- Undo the connection pipes [5] and remove the differential pressure control valve [4] from the upper and lower pipe work.
- Undo the sensing tube connection [6] on the differential pressure control valve [4].
- To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed.

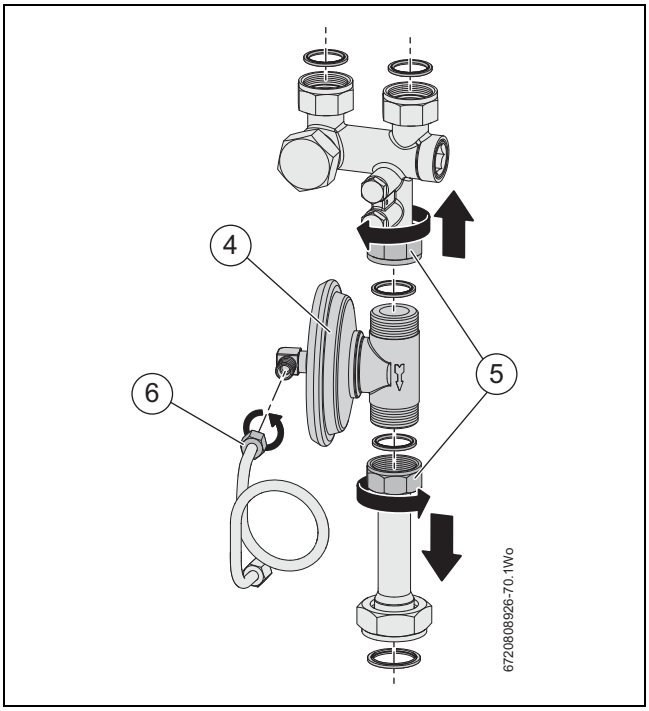


Fig. 64 Differential pressure control valve removal

8.5 Circulating pump

Refer to figure 65

- Ensure the appliance is fully drained.
- Disconnect the electrical connection from the circulating pump [1].
  - Use a flat bladed screwdriver to aid releasing the securing clip.
- Undo the connection pipes [2].
- Remove the circulating pump [1].
- To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed.

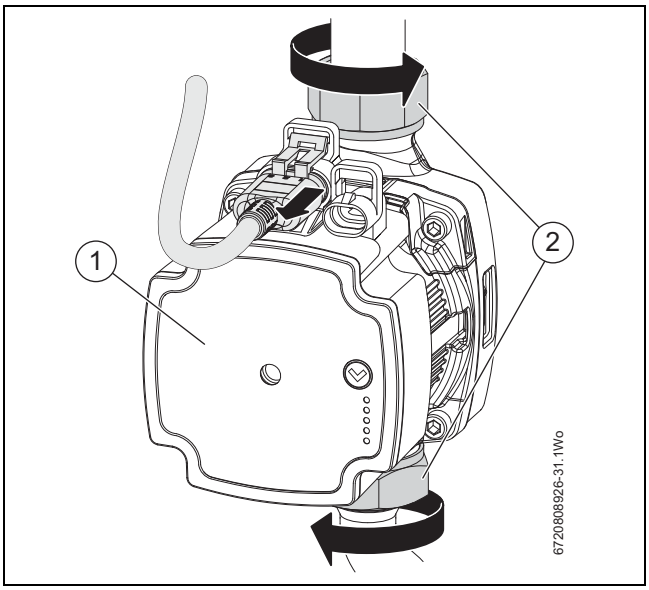


Fig. 65 Circulating pump removal

8.6 Heat meter

Refer to figure 66

- ▶ Ensure the appliance is fully drained.
- ▶ Release the integrator assembly[4] via the locking buttons [3] on either side of the extension arm.
- ▶ Undo the connection pipes [2].
- ▶ Remove the heat meter body[1].
- ▶ To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed.

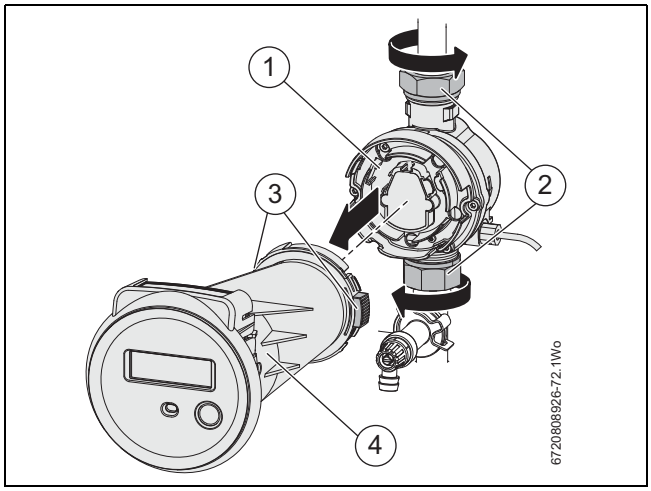


Fig. 66 Heat meter removal

8.7 Expansion vessel

Refer to figure 67

- ▶ Retract the securing clip [3] on the expansion vessel connector.
- ▶ Remove retaining screw [1] on the expansion vessel bracket.
- ▶ Ease forward and then lift up the expansion vessel [2] out of the connector and foam insulation.

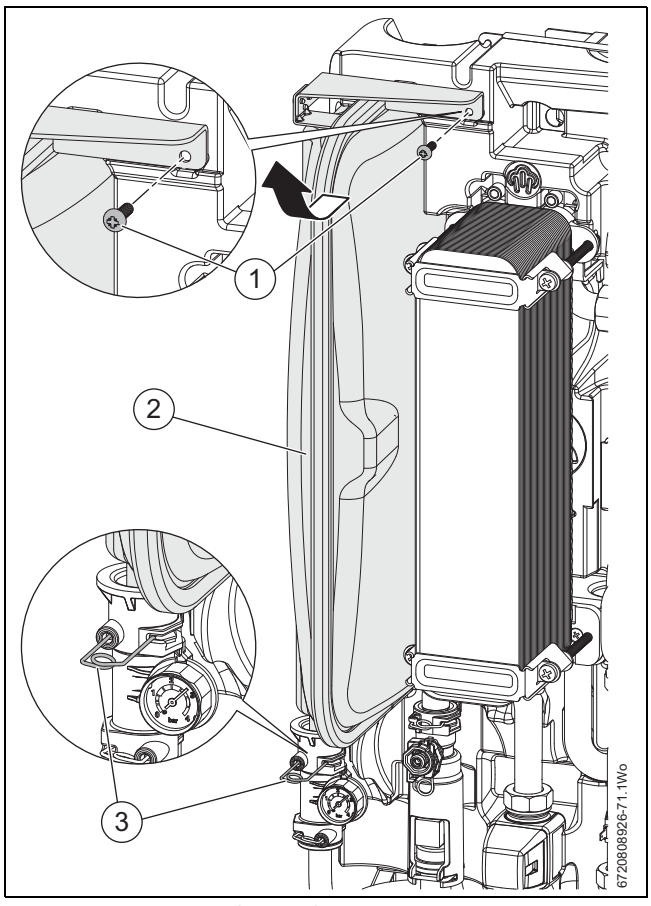


Fig. 67 Expansion vessel removal

8.8 Domestic hot water NTC sensor and safety valve

Hot water NTC sensor

Refer to figure 68

- ▶ Ensure the domestic hot water circuit is fully drained.
- ▶ Disconnect the electrical connection from the sensor.
- ▶ Withdraw the spring clip.
- ▶ Remove the sensor [1] from the housing [2].
- ▶ To refit follow the above actions in reverse.

Hot water safety valve

CAUTION: Correct orientation:
The safety valve will not work if installed incorrectly.

- ▶ When re-installing the safety valve, ensure correct orientation. The label indicates an arrow pointing in the direction of flow (downwards).

Replacement Hot water safety valve

- ▶ Only use the supplied Blue PTFE washer when replacing the Hot water safety valve.

Refer to figure 68

- ▶ Ensure the domestic hot water circuit is fully drained.
- ▶ Undo the connection pipes [3].
- ▶ Remove the safety valve.
- ▶ To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed.

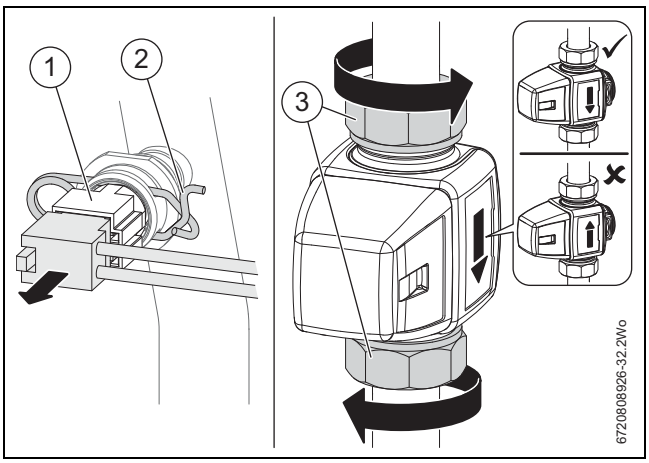


Fig. 68 Hot water NTC sensor and safety valve removal

8.9 Flow turbine, flow regulator assembly and filter

Refer to figure 69

- ▶ Ensure the domestic hot water circuit is fully drained.
- ▶ Disconnect the electrical connection from the turbine.
- ▶ Undo the connection pipe [5].
- ▶ Remove the spring clip [1] from the housing and remove the brass pipe [4].
- ▶ Remove the wire mesh filter [3] from the pipe.
  - – Clean thoroughly.
  - – Refit the wire mesh filter with the round end first.
- ▶ Withdraw the flow turbine and flow regulator assembly [2] from the housing.
- ▶ Separate the flow turbine [8] from the flow regulator housing [7] and flow regulator[6].
- ▶ Apply silicone lubricant to the seals to ease assembly.
- ▶ To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed.

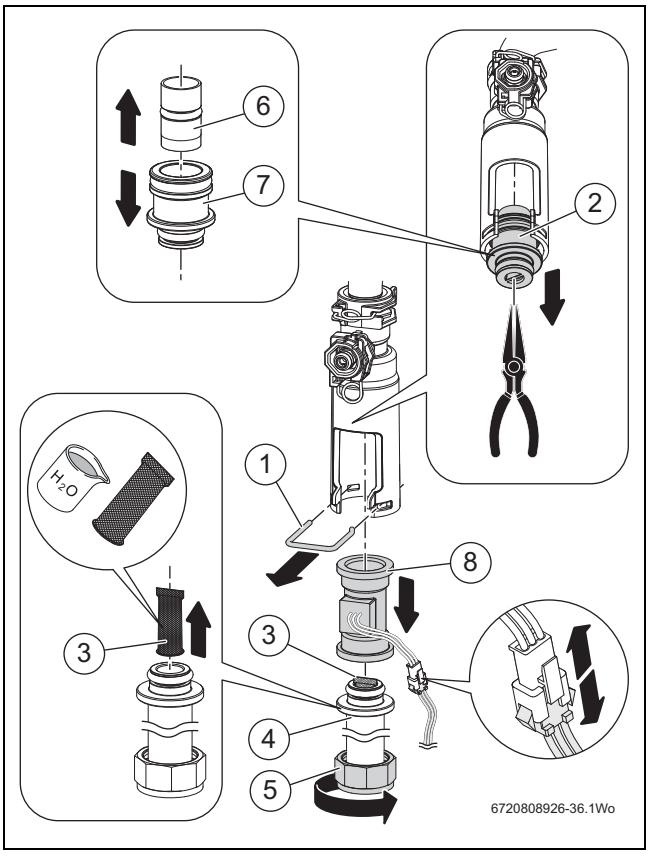


Fig. 69 Flow turbine, flow regulator and filter removal

Flow regulator

- ▶ Ensure that when replacing the flow regulator the correct one is fitted.

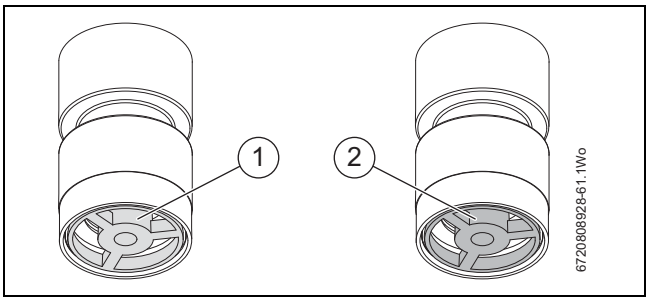


Fig. 70 Flow regulator identification

[1] 14 l/min - pink (39.1 kW)
[2] 21 l/min - red (58.6 kW)

8.10 Summer by-pass (if fitted)

Refer to figure 71

- ▶ Ensure the appliance is fully drained.
- ▶ Remove the securing clip [2].
- ▶ Undo the connection pipe [1].
- ▶ Remove the summer by-pass [3].
- ▶ To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed, and the securing clip [2] is fully engaged.

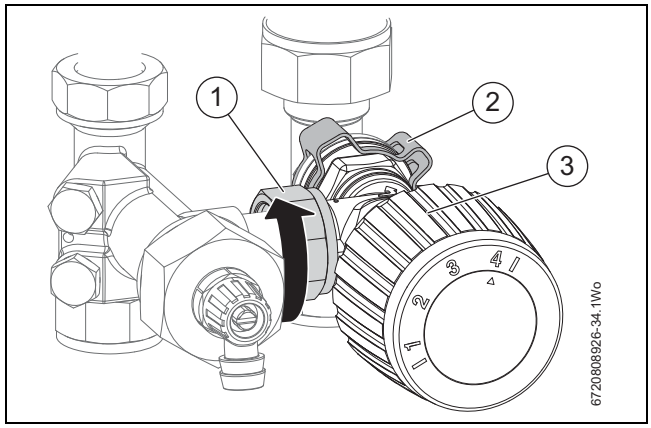


Fig. 71 Summer by-pass removal

8.11 District and central heating NTC sensors

Clipped NTC sensors

Refer to figure 72

The NTC sensors are clipped around their respective pipe work.

- District heating flow NTC sensor.
- Central heating flow NTC sensor.
- Central heating return NTC sensor.

- ▶ Disconnect the electrical connection from the sensor.
- ▶ Remove NTC sensor and clip [1] from the pipe.
- ▶ To refit follow the above actions in reverse.

District Return NTC sensor

Refer to figure 72

- ▶ Disconnect the electrical connection from the sensor.
- ▶ Unscrew NTC sensor and clip [2] from the manifold.
- ▶ To refit follow the above actions in reverse.

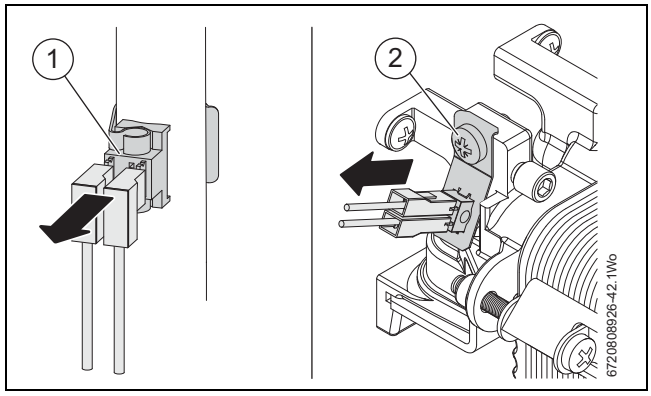


Fig. 72 NTC sensor replacement Indirect

8.12 Control unit

Refer to figure 73

- ▶ Ensure the power supply to the appliance has been isolated and secure against unintentional reconnection.
- ▶ The control box [1] incorporates a hook on the underside to support the control unit on the plate heat exchanger top bracket [2] whilst disconnecting the electrical connections on the control unit.
- ▶ Release the latches [4] using a thin bladed screwdriver. Arrows on the electrical cover indicate the position where the screw driver must be inserted to release the catches.
- ▶ Hinge open the connections cover [3].
- ▶ Remove the connections cover [3] by releasing the latches [5] using a thin bladed screwdriver.

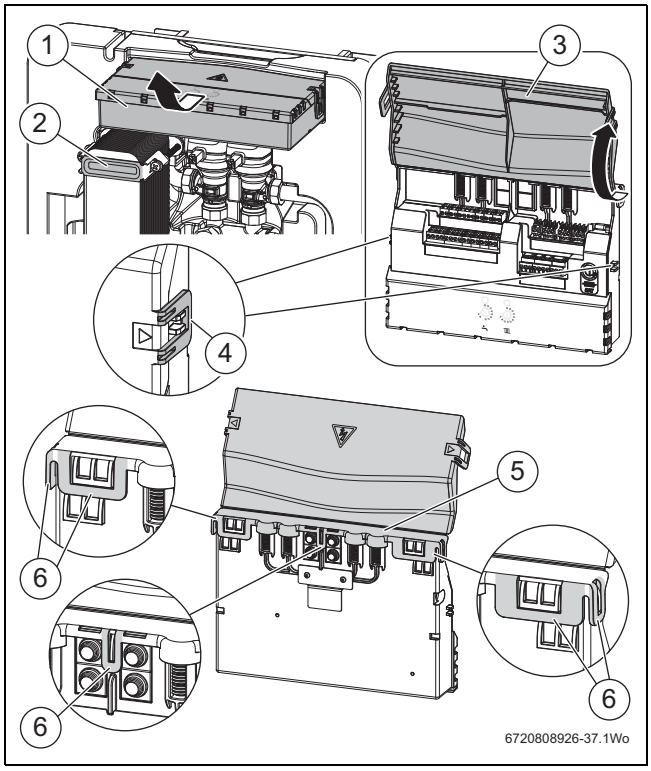


Fig. 73 Control unit replacement

- ▶ Before the control unit can be replaced, refer to figure 74:
  - Unplug connectors from the control unit.
  - Remove cables and associated strain reliefs, taking care not to damaged them.
- ▶ To refit, follow the above in reverse. Ensure all connectors, strain reliefs are securely fitted.

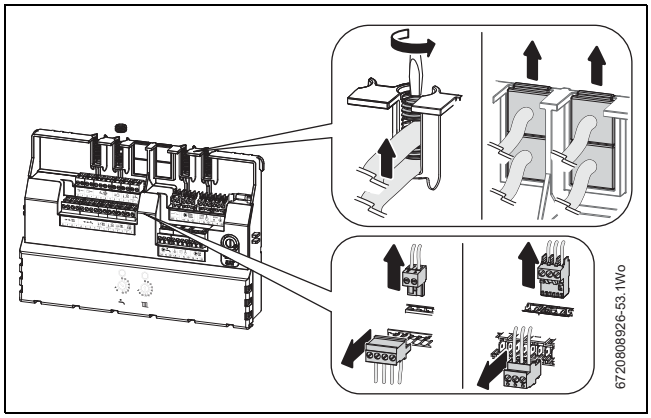


Fig. 74 Removing connectors and associated strain reliefs.

When re-fitting the cables and associated strain reliefs:

- ▶ Ensure the power cables and signal cables are replaced in the appropriate section of the control unit.

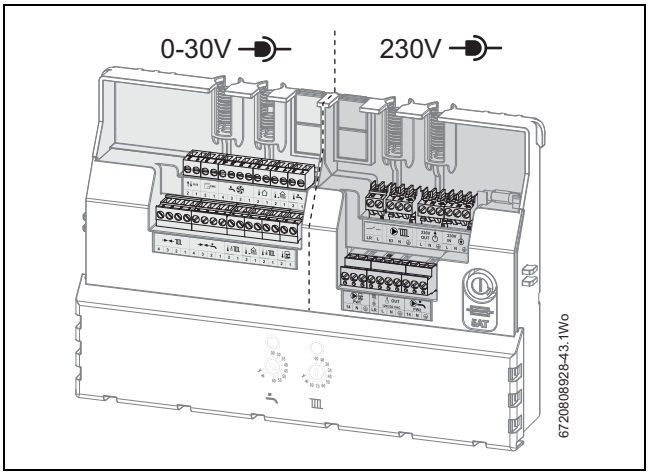


Fig. 75 Electrical connections

[0-30V] Low voltage (signal cables) connections side
[230V] Mains voltage (power cables) connections side

9 Fault finding and diagnostics

Basic checks
- ▶ Ensure that there is 230Vac power supply and the polarity is correct to the appliance.
- ▶ Ensure that the appliance/controller settings and functionality are operating correctly.

9.1 Central heating trouble shooting guide

Problem	Possible cause	Possibly solution/check
No heat output from HIU	Air in the heating system	▶ Vent the heating system fully at the radiator manual air vents, for indirect unit. ▶ Vent the HIU fully at the manual air vents. Ensure system pressure is between 1 - 2 bar
	Central heating pump faulty	▶ Check that there is power to the pump → section 6.3 for instructions on venting the appliance. ▶ Replace pump if necessary.
	Pump setting set too low	▶ Adjust pump to correct setting. → section 6.6
	Central heating filter blocked	▶ Clean filter (direct and injection models only)
	District heating filter blocked	▶ Clean filter
	Faulty central heating flow sensor	▶ Replace sensor
	Faulty central heating return sensor	▶ Replace sensor
	HIU Control unit incorrectly set or faulty	▶ Ensure that the flow temperature set-point is set correctly on the HIU controller. → section 6.4. ▶ Replace control unit if necessary.
	Room controller incorrectly set or faulty	▶ Check that room controller is set correctly and is calling for heat. ▶ Replace room controller if necessary.
	Faulty central heating control valve or dirt inside valve body causing low flow or no flow through district supply circuit	▶ Check that control valve is functioning correctly. → section 6.5. ▶ Perform re-calibration of control valve. See section 6.4. ▶ Open control valve manually using CH rotary switch on HIU control unit. → section 6.4. ▶ Replace control valve if necessary
	District supply temperature too low	▶ Check that the district supply temperature is correct for the required heat output. → Section 6.10, Central heating performance charts
	District flow rate is too low	▶ Check that the district flow rate is correct for the required heat output. → Section 6.10, Central heating performance charts
	District supply differential pressure is too low	▶ Check that the supply differential pressure is correct for the required heat output. → Section 6.10, Central heating performance charts ▶ Adjust the flow regulating valves at the heat interface unit to obtain the correct differential pressure. ▶ Increase the supply differential pressure on the system.
Central heating flow temperature too low	HIU Control unit incorrectly set or faulty	▶ Adjust HIU control unit. → section 6.4 ▶ Replace if necessary
	Room controller incorrectly set or faulty	▶ Adjust room controller. ▶ Replace if necessary
	Outdoor sensor positioned incorrectly	▶ Position outdoor sensor correctly
	District supply temperature too low	▶ Check that the district supply temperature is correct for the required heat output. → Section 6.10, Central heating performance charts
	District flow rate is too low	▶ Check that the district flow rate is correct for the required heat output. → Section 6.10, Central heating performance charts
	District supply differential pressure is too low	▶ Check that the supply differential pressure is correct for the required heat output. → Section 6.10, Central heating performance charts ▶ Adjust the flow regulating valves at the heat interface unit to obtain the correct differential pressure. ▶ Increase the supply differential pressure on the system.

Table 21 Central heating trouble shooting

Problem	Possible cause	Possibly solution/check
Central heating flow temperature too high	HiU Control unit incorrectly set or faulty	▶ Adjust HIU control unit. Ensure that the flow temperature set-point is set correctly on the HIU controller. → section 6.4 ▶ Replace if necessary
	Room controller incorrectly set or faulty	▶ Adjust room controller. Ensure that the flow temperature set-point is set correctly on the HIU controller. → section 6.4 ▶ Replace if necessary
	Central heating flow sensor out of position or faulty	▶ Ensure sensor is in correct position. ▶ Replace sensor
	Faulty central heating control valve or dirt inside valve body causing valve to seize.	▶ Check that control valve is functioning correctly. → section 6.5 ▶ Perform re-calibration of control valve. → section 6.4 ▶ Open control valve manually using CH rotary switch on HIU control unit. → section 6.4 ▶ Replace control valve if necessary

Table 21 Central heating trouble shooting

9.2 Domestic hot water trouble shooting guide

Problem	Possible cause	Possibly solution/check
Hot water flow rate is too low or no flow	Domestic cold water inlet filter blocked	▶ Ensure minimum inlet water pressure is 1.5-2 bar. ▶ Clean filter
	Inlet water pressure too low	▶ Increase domestic cold water supply pressure into HIU by consulting the water supply company. ▶ Clean plate heat exchanger if there are signs of calcification.
	DHW safety valve has closed due to a seized DHW control valve	▶ Check that control valve is functioning correctly. → section 6.5 ▶ Perform re-calibration of control valve. → section 6.4 ▶ Open control valve manually using DHW rotary switch on HIU control unit. → section 6.4 ▶ Clean valve if necessary. ▶ Replace control valve if necessary.
DHW temperature too low or varies excessively at the tap	HIU Control unit incorrectly set or faulty	▶ Ensure that the DHW temperature set-point is set correctly on the HIU controller. → section 6.4 ▶ Replace control unit if necessary.
	DHW flow turbine faulty	▶ Check electrical connections to flow turbine.Replace if necessary.
	Faulty DHW control valve or dirt inside valve body causing low flow or no flow through district supply circuit	▶ Check that control valve is functioning correctly. → section 6.5 ▶ Perform re-calibration of control valve. → section 6.4 ▶ Open control valve manually using DHW rotary switch on HIU control unit. → section 6.4 ▶ Clean valve if necessary. ▶ Replace control valve if necessary.
	District supply temperature too low	▶ Check that the district supply temperature is correct for the require heat output. → figure 53, Domestic hot water performance chart
	District flow rate is too low	▶ Check that the district flow rate is correct for the require heat output. → figure 53, Domestic hot water performance chart
	District supply differential pressure is too low	▶ Check that the supply differential pressure is correct for the required heat output. → figure 53, Domestic hot water performance chart ▶ Adjust the flow regulating valves at the heat interface unit to obtain the correct differential pressure. ▶ Increase the supply differential pressure on the system.
	Calcified plate DHW heat exchanger	▶ Check heat exchanger. ▶ Replace heat exchanger.
	Cross leaking DHW plate heat exchanger	▶ Replace heat exchanger.
DHW temperature too high at the tap	HIU Control unit incorrectly set or faulty	▶ Ensure that the DHW temperature set-point is set correctly on the HIU controller. → section 6.4 ▶ Replace if necessary

Table 22 Domestic hot water trouble shooting

Problem	Possible cause	Possibly solution/check
Time taken to get hot water at the tap is too long	Mechanical by-pass valve has dirt inside valve body	▶ Clean valve if necessary.
	Mechanical by-pass valve is set incorrectly, or is faulty	▶ Adjust by-pass valve. ▶ Replace if necessary.
	Faulty DHW control valve or dirt inside valve body causing low flow or no flow though district supply circuit	▶ Check that the control valve is functioning correctly. → section 6.5 ▶ Perform re-calibration of control valve. → section 6.4 ▶ Open control valve manually using DHW rotary switch on HIU control unit. → section 6.4 ▶ Replace control valve if necessary.
	District supply temperature too low	▶ Check that the supply temperature is correct for the required heat output. → figure 53, Domestic hot water performance chart
	District flow rate too low	▶ Check that the flow rate is correct for the required heat output. → figure 53, Domestic hot water performance chart
	District differential pressure is too low	▶ Check that the differential pressure is correct for the required heat output. → figure 53, Domestic hot water performance chart ▶ Adjust the flow regulating valves at the Heat Interface Unit to obtain the correct differential pressure. ▶ Increase the supply differential pressure on the system.
	Domestic hot water circulation pump out of operation	▶ Check that the pump is running correctly and that there is no air in the pump.
DHW safety valve closed	DHW control valve stuck in open position	▶ Check that control valve is functioning correctly. → section 6.5 ▶ Perform re-calibration of control valve. → section 6.4 ▶ Open control valve manually using DHW rotary switch on HIU control unit. → section 6.4 ▶ Replace control valve if necessary.
	Faulty DHW safety valve	▶ Replace DHW safety valve.
	Cross leaking DHW plate heat exchanger	▶ Replace DHW plate heat exchanger.

Table 22 Domestic hot water trouble shooting

9.3 HIU Control unit LED indications

Reason or Error	Left LED (DHW)	Right LED (CH)	Outcome
Outdoor temperature sensor error	No	No	No set point is set in case of weather compensated control - CH function does not detect a heat demand
CH flow temperature sensor error	-	Red	CH and frost protection functions are disabled
CH return temperature sensor error	-	Yellow	Limit return temperature functions are disabled
DHW volume flow sensor error	Red	-	DHW and circulation pump functions are disabled
DHW flow temperature sensor error	Red	-	DHW and circulation pump functions are disabled
Supply flow temperature sensor error	Red	-	By-pass, DHW and circulation pump functions are disabled
Supply return temperature sensor error	-	Yellow	Limit return temperature function is not working
Supply flow temperature lower than CH or DHW set points	Yellow	Yellow	Just error detected, HIU will keep on trying to supply heat
Supply flow temperature higher than allowed (95 °C)	Red	Red	Control valves will be kept closed and so no function except CH pump running can be executed
If a net connected HIU detects a CH module, a low loss header must be installed and its temperature sent to the HIU. If this temperature is not available the error becomes true	-	Red	CH function is disabled
PWM feedback signal indicates a CH control valve error	-	Red	CH and frost protection functions are disabled
PWM feedback signal indicates a DHW control valve error	Red	-	By-pass, DHW and circulation pump functions are disabled
CH rotary switch position is invalid	-	Red flashing	CH function is disabled
DHW rotary switch position is invalid	Red flashing	-	By-pass, DHW and circulation pump functions are disabled

Table 23

9.4 Control valve fault indication

The modulating control valves for CH and DHW have three indicators on the head of the actuator to denote operational states, see figure 7, Designation of components, items [4] and [5] to locate the valves.

The case, insulation and control box will need to be removed to gain access to the control valve indicators.

There are three symbols on the head of the valve actuator, behind these symbols are coloured indicators that are used to indicate the error situation. The table below gives details of the coloured indicators and their meaning:

Indicators ON	Reason/Problem
Green flashing	Valve is stuck completely open
Green and blue flashing	Valve is stuck between 60 and 99.9% open
Blue flashing	Valve is stuck between 40 and 60% open
Blue and Orange flashing	Valve is stuck between 0.1 and 40% open
Orange flashing	Valve is stuck completely closed
Green and Orange	The input signal is fault and the valve is completely closed
Green, Blue and Orange flashing	Faulty valve

Table 24 Control valve fault indication

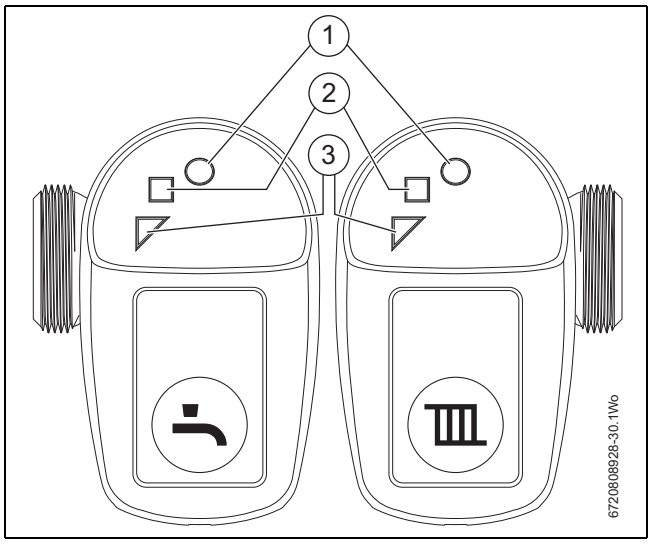


Fig. 76 Control Valve indicators

[1] Circle - Green
[2] Square - Blue
[3] Triangle - Orange

9.4.1 Action of control valve during an error

When an error occurs, there will be a recovery attempt made by the control unit. The valve will back off from its stuck position and then try to push through the blockage in order to reach its set point position. This recovery attempt will last approximately 0.5 seconds.

If this is successful, the error will reset.

If it is not successful, then an error signal is sent from the control valve to the control unit and the control valve will try to move to its closed position. If the control valve reaches its closed position but is still in error, an error signal is still sent to the control unit. The error will be indicated on the HIU control unit, → 9.3.

9.4.2 Control valve calibration

The control valve can be calibrated by:

▶ Manually set the rotary switch for the control valve on the control unit to the calibration position, (🔧).

The control valve will enter its calibration process below:

- Valve moves to fully closed position.
- Valve moves to fully open position
- Valve moves back to normal operation.

If the control valve has finished its calibration process but is still in calibration mode, the valve will move to fully open position and remains there for 10 minutes, or until calibration mode is exited:

▶ Manually setting the rotary switch for the control valve on the control unit to the required set point.

9.5 Circulating pump fault indication

If the circulating pump has detected one or more errors, the bi-coloured LED 1 switches from green to red. When an error is active, the LEDs indicate the error type as shown in table. If multiple errors are active at the same time, the LEDs only show the error with the highest priority. The priority is defined by the sequence of the table.

When there is no active error anymore, the user interface switches back to operation mode.

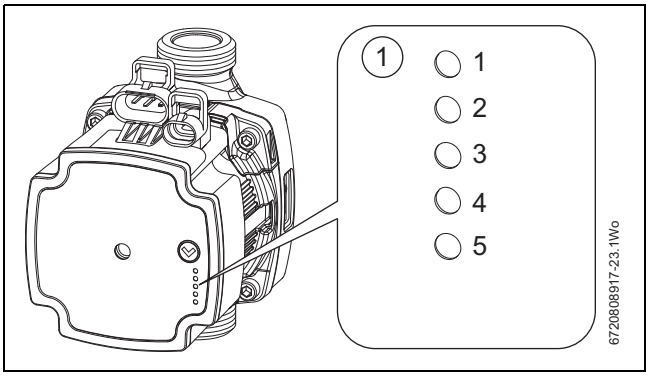


Fig. 77 Circulating pump fault indication

[1] LED indicators

Display	Indication	Pump operation	Counter action
One red LED + one yellow LED (LED 5)	Rotor is blocked.	Trying to start again every 1.33 seconds.	Wait or unblock the shaft.
One red LED + one yellow LED (LED 4)	Supply voltage too low.	Only warning, pump runs.	Control the supply voltage.
One red LED + one yellow LED (LED 3)	Electrical error.	Pump is stopped because of low supply voltage or serious failure.	Control the supply voltage/replace the pump

Table 25 Circulating pump fault indication

9.6 Central heating pump test

To check the pump operation of the central heating pump

▶ Set the central heating rotary switch to the pump (◀) position.
  – Ensure the central heating rotary switch is returned to its original position for normal central heating operation.

9.7 Heat meter (if fitted)

The integrator display an error message with the 3 letters “Err” and a code. If several errors occur at the same time, the different codes are shown sequentially.

The error is displayed in the first position of the display menu. It will still be possible to select all the other display menus by pressing the navigation button, refer to section 6.7.

If the navigation button is no longer pressed for a period of 3 minutes, the error code automatically appear again in the first position of a display menu. Display of an error automatically disappears when the error is no longer present.

- Err. 1
  - Flow higher that 1.2 x qs or defective hydraulic sensor.
- Err. 2
  - Measured temperature outside the homologated range or temperature sensor is defective.

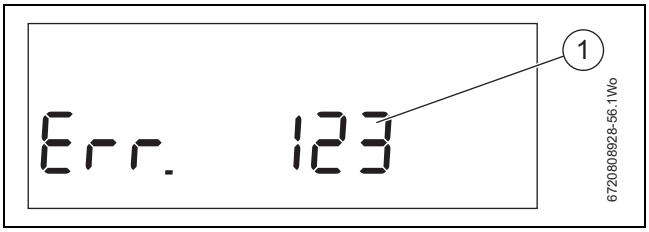


Fig. 78 Error display

9.8 Component resistance characteristics

9.8.1 Flow/return temperature NTC sensors

Resistance (Ω)	Temperature (°C)
29529	0
18787	10
12257	20
8186	30
5586	40
3889	50

Table 26 Central heating/district sensors

9.8.2 DHW NTC wet sensor

Resistance (Ω)	Temperature (°C)
14772	20
11981	25
9786	30
8047	35
6653	40
5523	45
4608	50
3856	55
3243	60
2744	65
2322	70
1990	75
1704	80
1464	85
1262	90
1093	95
950	100

Table 27 DHW wet sensor

9.8.3 Outdoor weather compensation sensor

Resistance (Ω)	Temperature (°C)
2392	-20
2088	-16
1811	-12
1562	-8
1342	-4
1149	0
948	4
842	8
781	10
642	15
528	20
436	25

Table 28 Outdoor weather compensation sensor

8716117751

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